

CHALLENGES CONFRONTING THE DOD LABORATORIES

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OF THE

RESEARCH AND DEVELOPMENT SUBCOMMITTEE

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LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
Washington, DC, February 22, 1990.

Hon. RONALD V. DELLUMS,
Chairman, Research and Development Subcommittee,
House of Representatives, Washington, DC.

Dear Mr. Chairman: We are pleased to provide you with this report of the proceedings of a workshop on Challenges Confronting the DOD Laboratories. This workshop, which was sponsored by the Subcommittee on Research and Development, House Committee on Armed Services, was held on October 18, 1989, with the assistance of the Congressional Research Service. The report of the workshop proceedings was prepared by Michael E. Davey, Specialist in Science and Technology, Congressional Research Service. Mr. Davey was also responsible for directing CRS efforts to assist the Subcommittee in holding the workshop.

The accompanying report is a record of the workshop. The perspectives, findings and recommendations presented are solely those of the workshop participants, and are not those of the Congressional Research Service. It is the policy of CRS to refrain from making policy or legislative recommendations.

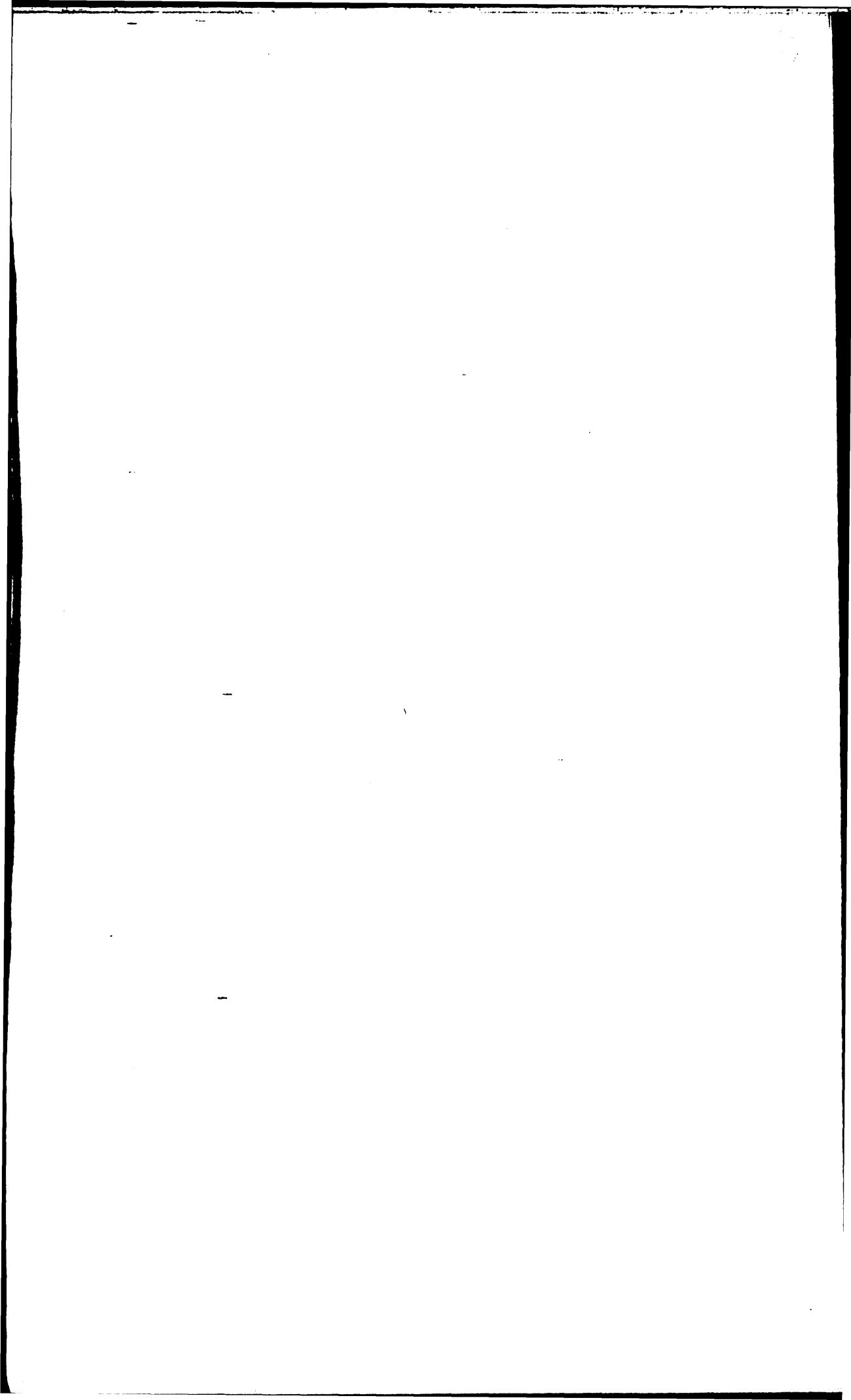
We are pleased that we could assist you in undertaking this project and hope that our assistance has been of value to the Subcommittee's activities.

Sincerely,

JOSEPH E. ROSS,
Director.

Enclosure.

Approved for printing:
LES ASPIN.



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EXECUTIVE SUMMARY

Since their establishment, the Department of Defense (DOD) research and development (R&D) laboratories have played a crucial role in the development and movement of technology into new or existing weapon systems. Nevertheless, in the past several years, a number of studies have documented a series of problems that continue to plague the DOD laboratories. Consequently, in October of 1989, at the request of the House Armed Services Subcommittee on Research and Development, the Congressional Research Service coordinated a one day workshop on "Challenges Confronting the DOD Laboratories." Over thirty people, from both inside and outside the DOD laboratory system attended the workshop.

The subcommittee requested that the workshop participants focus their attention on the following six issues: (1) too many laboratories functioning without a clear sense of mission; (2) personnel and salary restraints, which inhibit the hiring and retention of top scientists; (3) long delays in updating facilities; (4) funding that is often unpredictable; (5) burdensome procurement regulations; and (6) laboratory managers that lack sufficient authority to actually manage their laboratories.

Each workshop participant was sent a briefing paper which suggested three broad options Congress might consider in order to address the problems facing the laboratories. The first option was to allow the laboratories to implement incremental changes within the current civil service guidelines. The second option would permit some of the laboratories to convert to a Government-owned, contractor-operated (GOCO) facility. The third, and most aggressive option was to allow the three services to restructure their laboratories through closure and consolidation.

After reviewing the three options, the workshop participants made five recommendations: First, that Congress give DOD permission to adopt the China Lake Personnel experiment across all its laboratories. Second, that Congress adopt a separate pay schedule for laboratory managers and top level scientists in the laboratories. Third, to control the costs of the first two recommendations, they suggested that laboratory managers be given greater authority to consolidate and reduce staff in the laboratories. Fourth, that Congress amend specific procurement regulations that the participants believe have been inappropriately applied to science and technology activities in the laboratories. And fifth, if Congress declines to implement the four previous recommendations, then Congress

could establish an independent laboratory commission to suggest proposals for revamping the DOD laboratory system. The commission's membership could consist of both internal and external experts on the DOD laboratory system. Similar to the recent base closure commission, Congress could only accept or reject en bloc, all of the commission's recommendations.

CHAPTER 1—INTRODUCTION

In October 1989, a workshop was held for the House Armed Services Subcommittee on Research and Development to gather information and views on ways that the Department of Defense Laboratories could be made more effective in the face of new challenges. Assistance for the meeting was provided by the Congressional Research Service. This report presents the findings and recommendations of that workshop. The views and recommendations expressed in this report are not necessarily those of the Committee or the Congressional Research Service, but represent solely those of the workshop's participants. A list of the attendees and a statement of the workshop structure and charge are included in Appendices A and B. This report was prepared for the Subcommittee by Michael E. Davey, Analyst in Science and Technology, Congressional Research Service.

Over the past several years, a number of studies have pointed out numerous challenges facing the DOD laboratories. Specifically, congressional committees and DOD officials have identified several problems that appear to have become more onerous, and to varying degrees, may now be constraining the Department of Defense (DOD) laboratories' ability to perform certain national security responsibilities. To better understand these challenges, the House Armed Services Subcommittee on Research and Development requested that the Congressional Research Service (CRS) coordinate a one or two day workshop to focus on alternative approaches Congress could consider in order to address these laboratory problems.

In its letter, the subcommittee identified six problems or major issues that it wanted the workshop participants to address:

1. Many labs functioning without a clear sense of purpose, a loss of a well defined mission as indicated by the 1983 Packard report;
2. Personnel and salary constraints that inhibit the recruiting and retention of top scientific and management talent;
3. Long delays in updating buildings and purchasing major pieces of research equipment;
4. Funding that is often unpredictable: fluctuates from year to year, and can stifle long range planning activities;
5. Burdensome procurement regulations that often impede research and development activities within the laboratories; and
6. An overall management system which can burden laboratory directors and top managers with a morass of rules and regulations.

The subcommittee letter noted that perhaps, "through discussion and analysis there could result several change options which if implemented could lead to a more productive and flexible laboratory system capable of responding to the Department of Defense's changing needs." The primary purpose of the workshop was to ex-

plore under what management structures, personnel systems, and procurement regulations the laboratories might operate more effectively.

OVERVIEW OF THE WORKSHOP

In October of 1989, CRS coordinated with the Subcommittee a one day workshop on the DOD laboratories entitled, "Challenges Facing the DOD Laboratories: Where Do We Go From Here?" Over 30 representatives from the Office of the Secretary of Defense (OSD), the laboratories of the Army, Navy, and Air Force, the Department of Energy (DOE) national laboratories, and the private sector attended the workshop (see Appendix A).

Prior to attending the workshop, each participant was sent a workshop briefing paper. The primary purpose of the briefing paper was threefold. First, the paper identified and outlined the six specific laboratory issues that were identified in the Subcommittee's letter to CRS. Second, the paper reviewed three broad alternatives that Congress could consider in order to confront these concerns. And third, the briefing paper provided a common point of reference on issues confronting the laboratories and options for resolving those issues from which to initiate the workshop discussions. The three broad policy options considered by the participants at the workshop were:

1. INSTITUTE INCREMENTAL IMPROVEMENTS FOR THE DOD LABORATORY SYSTEM WITHIN THE CONSTRAINTS OF THE CURRENT CIVIL SERVICE GUIDELINES

This may be the most conservative of the proposed three options aimed at addressing the problems confronting the laboratories. The workshop participants were asked to examine such alternative proposals as: extending the principal features of the NOSC/China Lake personnel experiment¹ to other labs; providing the labs with expedient procurement procedures for scientific equipment and services; providing multi-year funding for the laboratories; and affording individual laboratory directors greater decision making authority and increased flexibility in managing the laboratories.

2. TREAT DOD'S R&D ACTIVITIES DIFFERENTLY BY ALLOWING SOME OF THE LABORATORIES TO CONVERT TO GOVERNMENT-OWNED, CONTRACTOR-OPERATED FACILITIES

The participants were asked to consider permitting the labs to operate differently from the rest of DOD thereby treating R&D activities differently from other Government activities. This could include allowing salaries of scientists and engineers to rise above civil service ceilings, and permitting the laboratory directors to improve facilities by side-stepping the traditional process of obtaining funds for the construction and renovation of laboratories. A broader approach also examined in this option was to allow some of the

¹ As part of the 1978 Civil Service Reform Act, DOD was allowed to implement a personnel demonstration project in two of its Navy laboratories. Currently referred to as the China Lake experiment, this demonstration project allows greater flexibility in applying Federal personnel guidelines within these two laboratories.

labs to convert to Government-owned, contractor-operated (GOCO) facilities, as suggested by the Defense Science Board in 1987.

3. CLOSE SOME LABORATORIES AND CONSOLIDATE OTHERS, WHILE MODIFYING MANAGEMENT ARRANGEMENTS FOR THE REMAINDER

The third option was the most ambitious, instructing the participants to review the overall structure of DOD's laboratory system. This included considering the closing of some labs, consolidating others, shifting the internal make-up and mission of some, and perhaps establishing a couple of new labs to meet DOD's changing requirements.

The participants were divided into three groups with each group asked to identify the broad implications of one of the three options for DOD's laboratory system. Further, as time would permit, each group was asked to outline the advantages and disadvantages for the option it was considering, and to discuss the extent to which each alternative could resolve the major laboratory concerns without compromising the overall mission of the DOD laboratories.

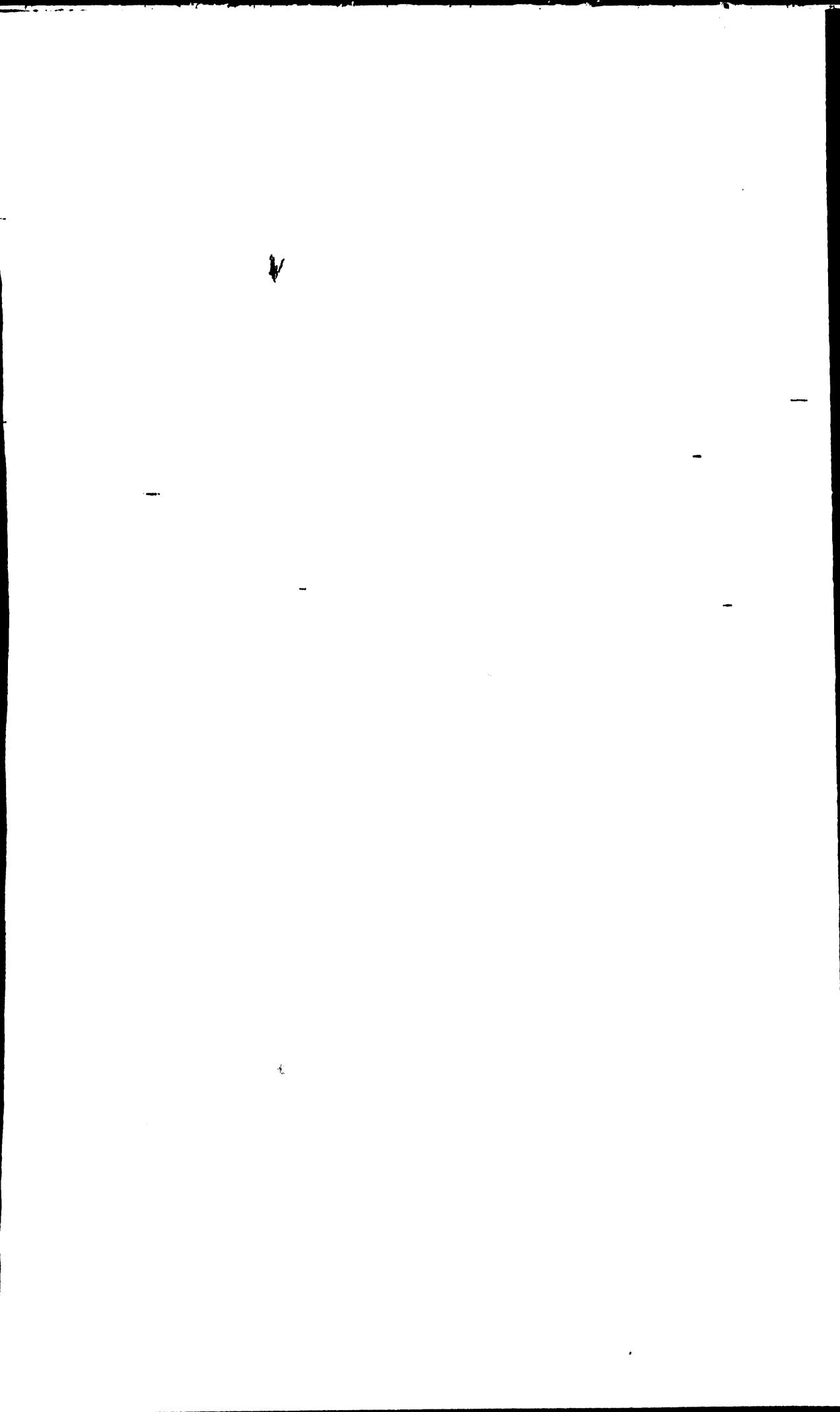
The participants understood that the findings and conclusions of the workshop would form the basis of a committee print for the Research and Development Subcommittee. The primary purpose of the committee print is to clarify various issues and options the subcommittee may wish to pursue in order to address the issues confronting the defense laboratories.

Finally, as the 1962 Bell study on the Federal labs concluded, the participants were reminded that there are "certain functions which should under no circumstances be contracted out. The management control of the Federal research and development effort must be firmly in the hands of full time Government officials clearly responsible to the President and Congress."² In the succeeding decades, Congress has recognized that the DOD continues to require a strong laboratory system to help meet its national security responsibilities.

OVERVIEW OF THE COMMITTEE PRINT

Chapter two of the committee print presents the findings and recommendations of the workshop participants. Chapter three analyzes the six major issues that have continually resurfaced in numerous reports on the DOD laboratories. This chapter also summarizes the workshop participants' responses to these six issues, and highlights some additional laboratory concerns that were raised by the participants. Chapter four outlines three broad options Congress might consider in order to confront the challenges facing the DOD laboratories. The chapter also summarizes the findings and overall recommendations of the workshop participants. It should be noted that although CRS staff participated in the organization and direction of the workshop as requested by the subcommittee, the views, findings and recommendations are those of the invited participants and not those of CRS.

² U.S. Congress. Office of Technology Assessment. Holding the Edge: Maintaining the Defense Technology Base. Apr. 1989, p. 25.



CHAPTER 2—FINDINGS AND RECOMMENDATIONS

REACTIONS TO THE SIX MAJOR LABORATORY ISSUES

This chapter summarizes the findings and recommendations of the workshop participants. During the opening session of the workshop, all of the attendees were given an opportunity to respond to the six issues that were outlined in the workshop briefing paper. The following represents a summary of the participants reactions to those issues. Chapter three of this report contains a more detailed account of the participants' comments.

a. *Similar lab issues go back to a 1961 laboratory study:* In general, the workshop participants agreed that the six issues on the conference agenda accurately reflected the major challenges facing the DOD laboratories. One of the participants pointed out that a 1961 study of the Air Force's R&D laboratories identified issues very similar to the issues this workshop is now attempting to address.

This led to a discussion of whether the laboratories could effectively operate with these concerns for another 30 years. The participants concluded that allowing the laboratories to continue to try to limp along with these concerns was not feasible. They noted that unlike the 1960s, such issues as growing salary disparities between the public and private sectors, deteriorating facilities, growing congressional and Pentagon micromanagement, and the tightening of "revolving door" regulations are now threatening the viability of DOD's laboratory system.

In short, the participants argued that although the conclusions and issues raised in the 1961 Air Force study may mirror those of 1989, the political and economic environment in which the laboratories must operate is significantly less tolerant of the problems, which have continued to challenge the DOD laboratories over the last three decades.

b. *Decline in the "quality of life" in the laboratories:* The workshop participants concluded that these continuing problems have contributed to a dramatic lowering of the overall "quality of life" in the laboratories. One laboratory manager indicated that rather than managing research, he spends most of his time trying to shield his people from requirements (e.g., excessive paperwork and detailed accounting of time on projects) that Congress and DOD have requested the labs to carry out.

c. *The laboratories need a high level advocate within the Office of the Secretary of Defense:* Some of the participants suggested that many of the problems the laboratories are encountering are exacerbated by the fact that the labs do not enjoy the support of a high level advocate within OSD and the Services. Several of the partici-

pants asserted that the China Lake personnel experiment (see footnote 1) could have been adopted throughout DOD if the Secretary of Defense and the Service Secretaries had pushed for its approval.

d. *Congress and DOD are not convinced there is a problem:* Finally, a couple of the participants indicated that Congress and DOD may not have acted on behalf of the laboratories because they question the credibility of past studies of the laboratories (approximately 18 major studies in the past 30 years) which consistently identify similar issues challenging the labs. Others argued that perhaps Congress and DOD had not intervened on behalf of the laboratories because they may not be convinced that these problems are actually threatening the viability of the laboratories.

FINDINGS AND RECOMMENDATIONS OF WORKSHOP SUBGROUPS

At the conclusion of the opening session, the participants were assigned to three separate groups with each group analyzing one of the three policy options outlined in the workshop briefing paper. The following is a summary of the findings and recommendations of each group. Chapter four contains a more detailed account of each group's discussion and recommendations.

OPTION I: INSTITUTE INCREMENTAL IMPROVEMENTS FOR THE DOD LABORATORY SYSTEM WITHIN THE CONSTRAINTS OF THE CURRENT CIVIL SERVICE GUIDELINES

a. *Adopt the China Lake personnel experiment:* The group analyzing the option made several specific recommendations. First, in the area of personnel, the group recommended that DOD and Congress take the necessary steps to adopt the China Lake personnel experiment across all the DOD laboratories. Further, they also supported Senator Bingaman's Compensation for Critical Employees amendment to the FY 1990 Defense Authorization bill then being considered by Congress.³

b. *Provide laboratory directors greater authority to consolidate and reduce staff:* Concomitantly, they indicated that any restructuring of DOD's laboratory compensation programs must provide laboratory directors with greater authority to consolidate and reduce staff, as well as to tie pay to individual performance and local area salary levels.

c. *Allow from 5 percent to 10 percent of the laboratories' budgets to be used for independent research:* The group endorsed the recommendation of the 1983 Federal Laboratory Review Panel, chaired by David Packard, that "at least 5 percent, and up to 10 percent, of the annual funding of the laboratories should be devoted to a program of independent research and development." Some in the group asserted that this money should be used at the laboratory director's discretion, within the guidelines established by OSD and the Services.

d. *Maintain the asset capitalization program and increase discretionary facilities funding:* The group made three recommendations.

³ This amendment was contained in S. 1352, DOD Appropriations for FY 1990 and FY 1991. The amendment was eventually dropped from the bill.

First, there was unanimous agreement in recommending that the Navy's Asset Capitalization Program (ACP) not be canceled.⁴ In fact, many in the group felt that the Army and Air Force should be permitted to initiate their own ACP.

Second, the group strongly endorsed a recommendation to establish a separate process for funding the modernizing and building of new laboratory facilities exclusive of the Military Construction (MILCON) account. They asserted that in the MILCON account, housing and other facilities are always given higher priority than R&D facilities.

Finally, the group recommended increasing the laboratory directors' authority for purchasing new facilities up to a maximum of \$2 million. The group concluded that the current limit of \$200,000 per project is not adequate to meet the future construction needs of the laboratories.

e. *Streamline existing procurement regulations:* The group concluded that Congress and DOD need to streamline procurement rules for the laboratories. They argued that the purchasing of basic research or research equipment should not be subjected to the same procurement regulations as buying an F-14 jet fighter.

f. *Every laboratory needs a principal reason for its existence:* As far as developing a clear mission statement, the group indicated that every laboratory needs a principal reason for its existence which is understood by all its employees and customers. The group indicated that if a laboratory is unable to define its mission, then it probably should close.

g. *OSD needs to appoint a high level advocate for the laboratories:* Finally, they recommended that OSD should identify a high level advocate for DOD's laboratories. According to the group, DOD currently lacks a strong defender of its overall laboratory programs. A strong advocate would have two primary responsibilities: (1) presenting a comprehensive review and summary of accomplishments of the DOD laboratories to Congress, and (2) acting as a strong proponent for the labs within the Department of Defense.

OPTION II: TREAT DOD'S R&D ACTIVITIES DIFFERENTLY BY ALLOWING SOME OF THE LABORATORIES TO CONVERT TO GOVERNMENT-OWNED, CONTRACTOR-OPERATED FACILITIES

Rather than develop a specific set of recommendations, the group analyzing this option attempted to determine the extent to which converting the DOD laboratories to a GOCO operation would help to alleviate concerns associated with the six major laboratory issues.

a. *The GOCO Option Would Help Reduce Laboratory Pay Disparities:* The entire group agreed that implementing the GOCO option would go a long way in helping to reconcile the pay differentials between the DOD laboratories and the university and private sector laboratories. A couple of participants claimed that the pay differential issues may now be threatening the long-term viability of some DOD laboratories.

⁴ The ACP is an overhead charge that the Navy laboratories charge their customers in order to pay for the replacement of research equipment.

b. *No real advantage exists in the area of facilities:* In the important area of facilities, a few of the participants asserted that some GOCO laboratory directors are allowed to go directly to Congress to try to persuade Members to support funding for important research facilities. DOD laboratory directors are rarely allowed such direct access to Congress. Nevertheless, the group concluded that the condition of overall laboratory facilities would not necessarily benefit from a GOCO conversion.

c. *A small advantage exists for certain procurement activities:* The group concluded that GOCOs appear to have some small advantage in the area of procurement. For example, a GOCO need abide by only the "spirit" of the Federal Acquisition Requirements (FAR). Consequently, for procurement activities they do not have to conduct full and open competition like the DOD laboratories. Nevertheless, the group was not sure that this advantage was sufficient to justify conversion to a GOCO.

d. *GOCOs may be losing their advantage in the area of management oversight:* Regarding the issue of burdensome management procedures, the group concluded that for some management functions, primarily in the area of personnel, the evidence is clear that GOCOs have a significant advantage in the hiring and retaining of top scientific talent. In other functions, the evidence is ambiguous at best. The group indicated that there does appear to be a sense that over the years, the differences separating contractor-operated laboratories and Government-operated laboratories have tended to become less pronounced.

e. *The only clear advantage for GOCOs is in the area of personnel:* The group concluded that the only outright advantage to GOCOs appears to be in the area of personnel. Nevertheless, due to recently discovered environmental and safety problems at DOE's weapon facilities, GOCOs may anticipate tighter congressional oversight. The group noted that these problems have raised a number of questions about how to manage and oversee the operation of a GOCO laboratory. At best, DOD may now be aiming at a moving target.

Consequently, this group did not make any recommendation as to whether any of the DOD laboratories should convert to a GOCO arrangement. Rather, in the end, the group asserted that if a laboratory really wanted to convert to a GOCO operation, it could be done.

OPTION III: CLOSE SOME LABORATORIES, AND CONSOLIDATE OTHERS, WHILE MODIFYING MANAGEMENT ARRANGEMENTS FOR THE REMAINDER

a. *The current laboratory arrangement will have to change:* Overall, the members of this group concluded that DOD's current laboratory arrangement is an accident of history, a "fossil." They stated that no one would deliberately design the current DOD laboratory system. They asserted that in light of recent changes in military threats, growing international competition, and available financial and technical resources, there is every reason to question whether the present laboratory structure is well matched to meet future national security needs.

b. *It is possible to close DOD laboratories:* The group concluded that it is possible to close some DOD laboratories. They noted that laboratory closings have been accomplished in the past, and could be done in the future. However, they warned against taking a piece-meal approach in closing one laboratory at a time. The group suggested that OSD and the Services develop an overall strategy for the Research, Development, Test, and Evaluation (RDT&E) program and determine the type of laboratory arrangement that might be required to meet that strategy.

c. *Certain criteria have to be met to close a laboratory:* The discussion concluded with the group suggesting some key elements or approaches that should be utilized if consolidation and closure are to be successful. These included, but were not limited to: taking care of the people; transferring the lab's management to a university or private entity; converting some laboratories to GOCOs or Federally Funded Research and Development Centers (FFRDCs); and allowing some of the laboratories to close through attrition.

FINAL WORKSHOP RECOMMENDATIONS

After analyzing the three different options, the workshop participants reconvened in a plenary session to present their separate group reports. Further, after considerable discussion about the reports, the participants advanced five recommendations.

First, they recommended strongly that Congress instruct DOD to implement the China Lake personnel experiment. All of the participants agreed that it was time to adopt this "experiment" which had been running for a decade. However, the participants also agreed that wider implementation of this experiment alone would not solve many of the human resource problems facing the DOD laboratories.

Second, the participants determined that adopting the China Lake experiment would not meet the current needs of senior scientists and top-level laboratory managers. Consequently, they recommended that Congress adopt Senator Bingaman's Compensation for Critical Employees proposal, as originally submitted in the FY 1990 and FY 1991 Defense Authorization Act.

The third proposal is aimed at controlling the costs of the first two. The participants agreed that laboratory directors would have to be given more freedom to reduce personnel and tie pay more closely to work performance. Without such authority and flexibility, the cost of the first two proposals would be prohibitive.

Fourth, the participants requested that Congress amend existing procurement regulations as they pertain to S&T activities in the laboratories. They said that it made little sense to require that procurement regulations designed for buying tanks and planes be equally applied to S&T procurement activities in the laboratories.

After much debate, the participants proposed a fifth and final recommendation. With great reservations, the participants suggested that Congress appoint an independent laboratory commission to develop a set of recommendations for restructuring the DOD laboratories. However, the participants indicated that Congress should take this action only if it were unable to implement the previous four recommendations. It was strongly urged that Congress consider acceptance or rejection of the commission's recommendations en bloc, similar to the recent base closure commission.

CHAPTER 3—MAJOR ISSUES CONFRONTING THE DOD LABORATORIES

INTRODUCTION

Since the establishment of the Naval Observatory in 1842, defense laboratories have played a crucial role in fostering innovative discoveries in science and technology. Over the past four decades, the Department of Defense (DOD) has invested extensive resources to build and maintain a laboratory system which can support research and development activities essential to national security.

The Pentagon contends that its laboratories play a crucial role in solving science and engineering problems and deficiencies, and in meeting needs that are unique to the military. DOD states that the primary purpose of its laboratories is to develop new technologies to support each of the respective Service missions. According to DOD, the role of the laboratories in the development and improvement of technology and weapon systems is fundamental to maintaining national security. Further, DOD asserts that the laboratories allow the military a fast reaction capability to solve immediate critical problems that may confront each of the Services.

According to DOD's most recent statistics, in FY 1986, its 72 R&D centers employed approximately 40,000 people and received a little more than \$10 billion from the Federal Government.⁵ Of that amount \$3.7 billion was spent in-house; the rest was contracted out.

It is important to understand that the individual Services, rather than DOD, really run the laboratories. In fact, the Army, Navy, and Air Force departments own and operate a large number of research, development, and engineering (RD&E) centers. They perform a variety of activities ranging from research (albeit very little compared to the laboratories' overall activities), to full-scale development, to occasional limited-scale manufacturing of military equipment. For practical purposes, the term "DOD laboratories or defense laboratories" refers to these Government-owned and operated RD&E centers.

Further, comparing the defense laboratories among themselves can be deceiving, since no two are alike. They differ in the subject areas they focus on, the mix among categories of work (e.g., the proportions of basic, applied, and development activities each performs), and the weighing of their missions among a number of basic tasks. Clearly, the differences among the Services' laboratories make evaluation and comparative analysis difficult to achieve.

⁵ There are about an equal number of other centers that do not perform traditional RDT&E activities, but rather are special facilities with very specific missions, such as flight-testing new or refurbished aircraft.

For example, the DOD laboratories are often criticized for not doing top-flight research, especially when compared to the Department of Energy's (DOE) national laboratories. However, as indicated earlier, performing leading edge scientific research is not the primary mission of these facilities.

Despite these differences there are some common threads interwoven among all the activities the laboratories must perform. They are all expected to be centers of technical expertise that allow the Services to be "smart buyers" of technology and weapon systems. Most do not require the staff to conduct research and contribute to the advancement of science in general, but all benefit from having some staff involved in research and knowledge about research occurring outside of the laboratory. To varying degrees they all develop technology in-house and externally under contract, with the aim of transferring it into the procurement system. Finally, the accumulated base of knowledge gained through these activities is used to advise procurement officers on the technical qualities of various proposals to develop and build systems.⁶

The next section of this chapter reviews several issues that have continued to surface in reports on the DOD laboratories and that were discussed at the workshop.⁷ The workshop participants were afforded the opportunity to suggest additional issues. Each of the six issues, outlined below, are followed by a summary of the initial responses to the issues by the workshop participants.

SUMMARY OF MAJOR ISSUES

1. MANY LABORATORIES ARE FUNCTIONING WITHOUT A CLEAR SENSE OF PURPOSE, AND A WELL DEFINED MISSION, AS INDICATED BY THE 1983 PACKARD REPORT

The 1983 Report of the White House Science Council, commonly referred to as the Packard report, observed that some of the laboratories that were reviewed had a fairly well defined mission for some of their work, but that a major part of what they were doing was "fragmented and unrelated to their mission." The report noted that this often occurs when the national need that justified the creation of the lab no longer exists or is a lower priority.⁸

Siegfried S. Hecker, Director of Los Alamos National Laboratory, contends that a laboratory's ability to hire and keep top scientific talent is dependent upon the development of a strong primary mission. A strong, well articulated mission can also attract long-term stable support for high-risk activities in science and technology. According to Hecker, laboratories that lack a clear mission find it difficult to "resist the forces that can quickly dilute its efforts and fragment its lines of authority and reporting into numerous, independent efforts."⁹ Such fragmentation can often cause laboratory

⁶ U.S. Congress. Office of Technology Assessment. Holding the Edge: Maintaining the Defense Technology Base. Apr. 1989, p. 23.

⁷ A 1987 Defense Science Board study of DOD's technology base programs listed 16 separate studies of the DOD labs, beginning with the 1966 Sheingold report. See Appendix D., p. D-3.

⁸ Executive Office of the President. Office of Science and Technology Policy. Report of the White House Science Council, Federal Laboratory Review. Washington D.C., May 1983.

⁹ Testimony before the Senate Armed Services Committee. Subcommittee on Defense Industry and Technology. Mar. 18, 1988. p. 14.

managers to lose control of the laboratory's efforts, and can turn them into administrative officers rather than leaders.

The 1983 Packard-report indicated that laboratories with a well defined mission tend to be more successful in achieving specific goals. According to the report, those laboratories whose original mission no longer serves high-priority national needs should seek out a new mission, or failing that, should close their doors. It noted that the Services' laboratories differ widely in statements of their missions, varying from language with specific guidance to a mission that must be inferred from the RD&E activities that people do at the laboratory. As discussed in the Packard report and a DOE report on multipurpose laboratories, the primary mission of many laboratories remains murky even though a clear and consistent sense of its mission is vital to its success.¹⁰

2. PERSONNEL AND SALARY CONSTRAINTS INHIBIT THE RECRUITING AND RETENTION OF TOP SCIENTIFIC AND MANAGEMENT TALENT

According to the Office of the Secretary of Defense (OSD) and Service representatives, DOD is often unable to recruit the very best scientific talent available. Further, because of growing salary disparities between the Government and the private sector, OSD is currently experiencing high rates of attrition within its top level S&T managers. In fact, every study of the military laboratories has identified deficiencies in the way labs recruit, train, retain, and manage their professional personnel. Both the Packard report and a 1987 Defense Science Board (DSB) report concluded that OSD and the Services face serious disadvantages in hiring and retaining top S&T personnel for three primary reasons: inadequate civil service compensation; "revolving door" restrictions; and a lowering of status associated with Federal employment.¹¹

The 1987 DSB report pointed out that private sector starting salaries for newly hired scientists and engineers (S&Es) with bachelors degrees, averaged \$10,000 to \$15,000 higher than comparable Federal employees. The Defense Science Board reports that top scientists at the DOE national laboratories operated by contractors are often paid twice as much as their Federal counterparts currently earning between \$50,000 and \$60,000 per year. This is crucial because laboratory directors generally agreed that those S&Es that make-up the top 5 percent of the laboratory determine the major science and technological thrusts of the laboratory. An internal study conducted at the Naval Research Laboratory (NRL) indicated that between 1985 and 1987, NRL was unable to fill 40 percent of its science and engineering positions due to inadequate compensation.¹²

¹⁰ Domestic Models for National Laboratory Utilization. T.J. Wilbanks in the U.S. Dept. of Energy, Office of the Secretary. The Department of Energy's Multiprogram Laboratories. v. II. Sept. 1982. p. 68.

¹¹ Executive Office of the President. Office of Science and Technology Policy. Report of the White House Science Council, Federal Laboratory Review. Washington D.C., May 1983. p. 6. Office of the Under Secretary of Defense for Acquisition. Report of the Defense Science Board 1987 Summer Study on Technology Base Management. Dec. 1987. p. 16.

¹² Internal Naval Research Laboratory study on Future Operating Options for the Navy Laboratories. Sept. 1988. p. 35.

Pre-employment and post-employment personnel restrictions reportedly mitigate against recruiting first-rate political appointees. In the pre-employment arena, political appointees are required to divest themselves of any financial interest that they have in any company conducting business with DOD. Such a requirement often results in serious tax consequences for the political appointee. Furthermore, many potential employees resent the prospect of filing an annual financial disclosure statement.

According to OSD and Service representatives, conflict-of-interest legislation has significantly limited DOD's ability to hire top-level S&T managers from the private sector who have had experience working in the defense arena. Compared with their predecessors, many top level S&T managers reportedly now come to DOD with little or no defense experience.

3. LONG DELAYS OCCUR IN MODERNIZING FACILITIES AND PURCHASING MAJOR PIECES OF RESEARCH EQUIPMENT

The ability to conduct leading edge research also depends on laboratories being able to purchase state-of-the-art research equipment and facilities. Further, it is widely recognized in academia, Government, and industry that modern research facilities serve as a strong attraction when recruiting scientists. In turn, an excellent research staff, to a degree, will help generate good facilities.

DOD laboratories face facilities modernization problems for several reasons. First, as the 1987 DSB report noted, DOD laboratory directors do not have control over many crucial laboratory support elements, including facilities. Those individuals in the laboratories responsible for facilities activities report either to the Services' "buying commands" or headquarters. Secondly, requirements for new R&D facilities are combined in with the overall military construction (MILCON) budget. This means that laboratory facilities must compete with higher priority items such as military housing.

According to the DSB, this has led to a decline in the physical facilities supporting the DOD's R&D laboratories. NRL recently estimated that at the current rate of existing facilities replacement and renewal, it will take almost 80 years to renovate the laboratories' outdated facilities. Obviously, at this rate, NRL and the DOD laboratories in general will not be able to keep pace with the equipment they will need or the missions they are designed to support.

However, it should be pointed out that there are those who believe that this problem may not be the result of DOD laboratories being Government-owned and Government-operated (GOGO) facilities. For example, both NASA centers and the National Institute for Standards and Technology (NIST) have demonstrated greater success in this area. NIST appears to do better because of the lead role it plays in measurement science, and because it has strong ties to industry. At NASA, the centers have a stronger voice in defining their programs and enjoy stronger ties with their principal buyers than do the DOD laboratories. Further, it is not clear that privately owned or university labs have a significant advantage over the DOD labs in facilities and equipment modernization. In some cases the advantage here may favor the DOD labs.

4. FUNDING WHICH IS OFTEN UNPREDICTABLE, FLUCTUATES FROM YEAR TO YEAR, AND CAN STIFLE LONG RANGE PLANNING ACTIVITIES

According to Robert J. Art, effective budgeting procedures help top-level decision makers do three things. The first is to develop a medium to long-term planning frame work to guide their decisions. The second is to make strategic trade-offs in how resources are allocated throughout the organization. And the third is to evaluate the results of their decisions so they can be included in the next round of planning.¹³

The 1983 Packard report concluded that the process by which laboratories are funded essentially prohibits rational planning and effective conduct of R&D. The annual budgeting process was said to consume too much time at too many layers both within DOD and the Services. The Packard report pointed out that delayed congressional appropriations contribute to indecision, often well into the next fiscal year when all funds must be obligated.

The cost of annual budgeting has been to devalue the planning and evaluation phases of the resource allocation process. Annual budgeting cycles have greatly contributed to a short-term planning focus among the DOD laboratories. Several studies have indicated that laboratory directors instead of focusing on systematic evaluation of R&D activities, are usually pre-occupied with the annual "battle of the budget."

Starting in FY 1988, DOD submitted to Congress two-year RDT&E budgets for FY 1988 and FY 1989. However, the two-year budget applies to authorizations, not to appropriations. Further, when funds finally reach the laboratory, it is usually very difficult to transfer them to other accounts where they might be needed more. The funds also must be obligated in the fiscal year for which they were appropriated, preventing the development of a contingency fund. Such a requirement makes it very difficult for DOD to sustain long-term work.

5. BURDENOME PROCUREMENT REGULATIONS OFTEN IMPEDE RESEARCH AND DEVELOPMENT ACTIVITIES WITHIN THE LABORATORIES

Study after study of the defense procurement system has noted the frustration with the growing length of the procurement process. Delays in weapons acquisition lead to lost time in fielding new weapon systems which could threaten the U.S. technological lead. The introduction to a review of six major studies of defense procurement states that "the bulk of the cures proposed as far back as 1948 were still being proposed in 1983 because they had never been implemented."¹⁴

Laboratory directors have little control over the procurement office in their laboratories. One ongoing study of the U.S. laboratory system compared the amount of time it took laboratory personnel to complete typical procurement actions among industry, uni-

¹³ Art, Robert J. The Pentagon: The Case for Biennial Budgeting. *Political Science Quarterly*. Summer 1989. p. 195.

¹⁴ U.S. Library of Congress, Congressional Research Service. Defense Acquisition: Major U.S. Commission Reports (1949-1988) v. I, by David Lockwood, Andrew Mayer, and Cheryl Crow. Prepared for the Defense Policy Panel and Acquisition Policy Panel of the Committee on Armed Services, House of Representatives, Committee Print No. 26. Nov. 1, 1988. p. v.

versity and Government R&D laboratories. The authors asked representatives from these laboratories to indicate the length of time it took to: (1) buy low-cost (less than \$1,000) and high cost (more than \$1,000) equipment; (2) acquire internal funding for individual investigator research; and (3) get approval for intermediate to large-scale team research.¹⁵

For low and high cost research equipment, Federal laboratories, on average, took about two weeks longer to purchase equipment than did industry and university laboratories. To acquire approval for individual investigator research and internal large scale research Federal laboratories took twice as much time (7.4 weeks versus 15.5 weeks) as did the other laboratories. The average time for Federal laboratories to approve large scale team research was 26 weeks, while all the other laboratories required half that time.¹⁶

6. AN OVERALL MANAGEMENT SYSTEM WHICH CAN BURDEN LABORATORY DIRECTORS AND TOP MANAGERS WITH EXCESSIVE RULES AND REGULATIONS

The 1983 Packard report on the Federal laboratories indicated that excessively detailed instruction for R&D programs, both from Congress and DOD itself, commonly referred to as micromanagement, "has seriously impaired R&D performance in some laboratories." The growth of the internal DOD budget review process, along with increased congressional budgetary oversight has created extensive management layers within DOD and, it is complained tied the hands of many top level laboratory managers.

According to a recent article, in 1970, Congress requested 31 reports or studies from DOD. By 1985, that number had climbed to 458. Concomitantly, legal provisions detailing how DOD is to carry out certain aspects of its responsibilities increased from 64 to 213, while annual congressionally mandated actions requiring specific DOD compliance increased from 18 to 202.¹⁷ Much of this came about as in response to widespread and widely reported waste, fraud, and mismanagement in the huge defense acquisition system for goods and services. As a result, in many laboratories, the role of the research managers and branch chiefs has changed dramatically. Rather than overseeing and evaluating the quality and relevance of R&D activities in the laboratories, they spend most of their time shielding bench scientists from various reporting tasks generated by DOD and Congress.

Finally, as indicated earlier, laboratory directors are often held accountable for important activities for which they have no authority. For example, at most DOD laboratories, individuals charged with crucial support activities (e.g., facilities, personnel, procurement, financial management, legal counsel, etc.) often report to other organizations that do not have responsibility for facilitating the laboratory's mission. The 1983 Packard report suggested that

¹⁵ Crow, Michael M. and Barry L. Bozeman. *Bureaucratization In the Laboratory. Research and Technology Management.* Sept.-Oct. 1989, p. 30.

¹⁶ Ibid., p. 31.

¹⁷ Kaufman, Daniel J. *National Security: Organizing the Armed Forces.* Armed Forces & Society. Mar. 16, 1988. p. 5.

laboratory directors be given authority for all activities necessary for the laboratory to achieve its mission.

WORKSHOP PARTICIPANTS' RESPONSES TO THE SIX IDENTIFIED ISSUES

The opening session of the workshop provided the participants with an opportunity to comment on the six major issues confronting the DOD laboratories and to suggest additional issues relating to options for improving the overall effectiveness of the laboratories.

The discussion began with a comment about the findings of a 1961 study on the Air Force R&D laboratories. One of the participants noted that many of the laboratory issues, identified in the 1961 study, are the same as those outlined above. In fact, he asserted that the conclusions of the Air Force study are just as appropriate today as they were almost thirty years ago. This led to a exchange among the participants as to whether the DOD laboratories could effectively operate for another 30 years faced with these same problems. The general consensus was that the environment in which the laboratories have to operate has changed so dramatically that "Congress and DOD do not have another 30 years to address these issues."

The participants then proceeded to outline how the research environment has changed over three decades. They noted that issues associated with recruiting and retaining scientists and engineers (S&Es) in 1989 are more serious than those in 1961. DOD still pays its S&Es less than their private sector counterparts, and the disparity between these two groups has widened considerably since 1961.

An unpublished 1988 Navy study was cited, finding that since the early 1980s, the discrepancy between Federal salaries and salaries in industry and academia has greatly accelerated.¹⁸ For example, the average compensation for S&T managers in the upper 10 percent of the private sector was \$40,000 to \$50,000 higher than their Government counterparts. Another Navy study of university principal investigators (PI) found that for the first time, the majority of PIs' salaries were higher than Government salaries.¹⁹ Some 60 percent of the university PIs are paid salaries that exceed the Federal pay cap, with approximately one-third of them exceeding \$90,000.

According to the workshop participants, recent congressional legislation tightening "revolving door" restrictions has made it almost impossible for DOD to hire top level personnel from the private sector. During the 1960s, DOD was able to recruit top level executives from various defense related industries. These individuals could afford to accept a top-level public service position at the Pentagon (usually at a lower salary) because once they had completed their "service to the nation", they could return to their previous positions in the private sector.

¹⁸ Internal Naval Research Laboratory study on Future Operating Options for the Navy Laboratories, Sept. 1988.

¹⁹ Office of Naval Research internal report on the compensation of university researchers, Nov. 1988.

However, according to the participants, current post-employment personnel restrictions prevent most individuals from returning to their previous private sector positions.²⁰ In essence, the participants argued that current revolving door legislation forces potential top-level DOD personnel to end their private sector careers in order to accept employment at the Pentagon.²¹ Unlike the 1960s, very few top level managers and senior scientists within DOD now have had extensive defense related experience in the private sector.

Further, it was complained that, if these impediments were not enough, potential DOD employees are now faced with ever increasing congressional oversight, or what most of the attendees referred to as "congressional micromanagement." This group asserted that congressional micromanagement, or what some called "inappropriate congressional meddling" in high tech programs, has grown exponentially since the 1960s.²² A recent OSD report accused Congress of loading down DOD with an excessive number of reports. According to the study, in 1970, at the height of the Vietnam war, Congress asked DOD for 36 reports or studies; in 1988, Congress called for 719 special reports or studies.²³

These observations led to a discussion of "the quality of life" within the laboratories. The participants felt this issue should have been included in the briefing paper. They indicated that the overall quality of life in the laboratory has deteriorated over the past 30 years. Some of the participants argued that this issue is an insidious threat to the overall effectiveness of the laboratories. It was pointed out that it is hard for the laboratories to fulfill their missions when: (1) Federal employees are continually "bashed" by the media; (2) research facilities continue to deteriorate; (3) laboratory personnel work in a non-competitive pay environment; (4) Congress and DOD engage in micromanagement of the labs; and (5) laboratory managers are prevented (by Congress and DOD) from managing their labs.

One laboratory manager said that rather than managing research, he spends most of his time trying to shield his people from requirements that Congress and DOD have asked the labs to carry out. Some of the participants indicated that, over the years, laboratory managers have been slowly transformed into "glorified contract administrators."

This group also raised the need of a high-level advocate for the RDT&E program. This also includes the laboratories, which contribute to the overall success of the RDT&E program. It was stated

²⁰ The revised law restricts the types of activities former officers and DOD employees can perform for a potential employer that does business with the Defense Department. Among other things, this law provides a "two-year ban on certain former Department of Defense personnel receiving compensation of more than \$250 from defense contractors (who have contracts in excess of \$10 million with the Government) if the former officers or employees had official procurement duties relating to that contractor during the two year period prior to separation from Government service."

²¹ There is some debate whether current legislation would in fact prevent someone from returning to their previous position, if they were not directly involved with any defense contracts. However, most top level private sector executives reportedly do not appear anxious to test the new law.

²² The group made no attempt to analyze why Congress has increased its oversight of DOD over the past 20 years. There was not any acknowledgement of growing congressional concern regarding waste, fraud, and abuse within DOD and the Federal Government in general.

²³ DOD Accuses Hill of Excessive Regulations/Special Items. Defense Daily. Dec. 12, 1989. p. 383.

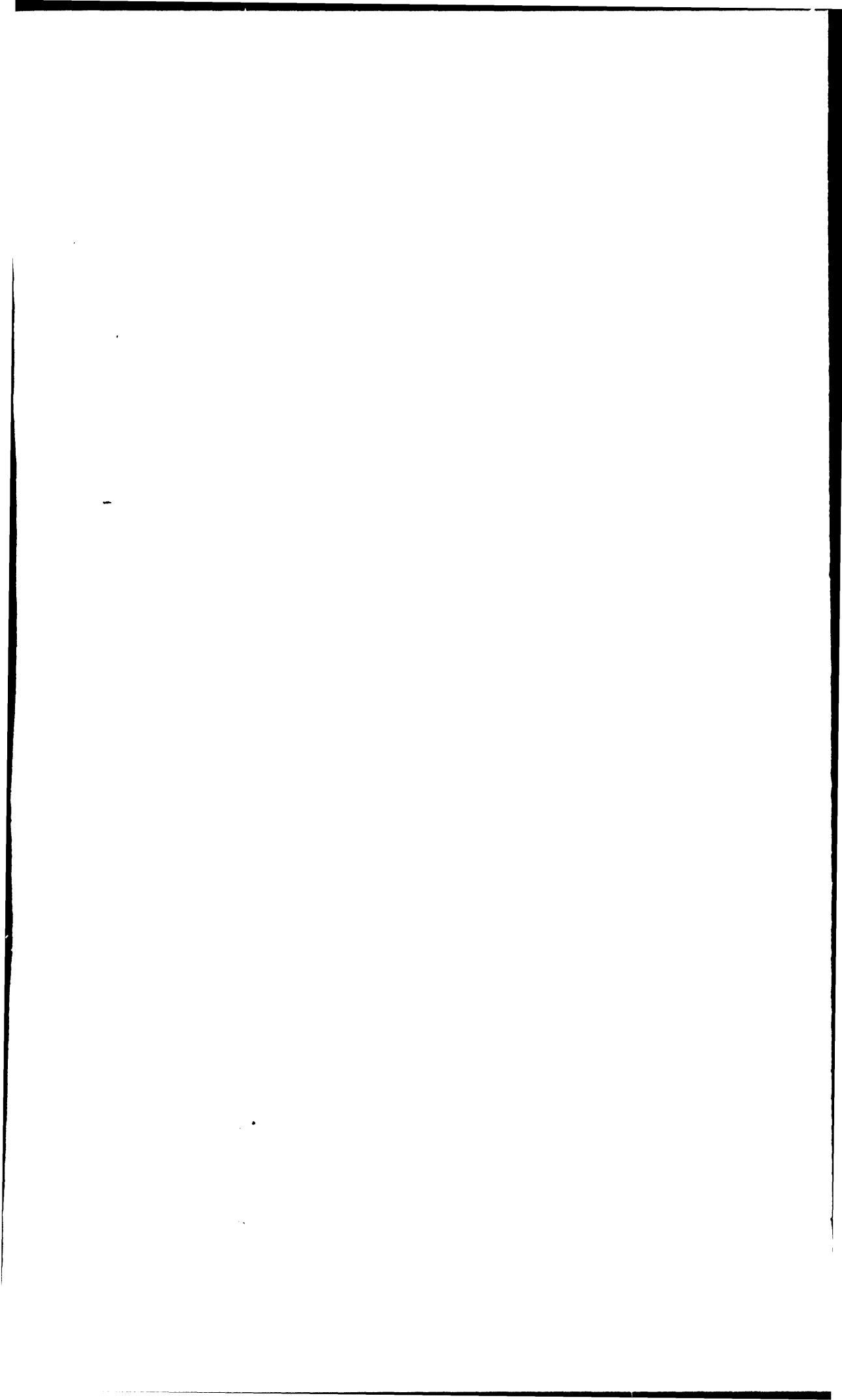
that there is no single high level voice within DOD and the Services that possesses the power and influence to champion and protect the interest of the laboratories. Some of the participants suggested that the China Lake personnel experiment could have been adopted throughout DOD if the Secretary of Defense and the Service Secretaries had pushed for its approval.

Further, some of the workshop attendees indicated that the lack of a strong advocate for the labs has contributed to a misunderstanding of their role. They indicated that the Services and OSD often fail to give the laboratories proper credit for their important accomplishments. For example, when their technology is successfully adopted by industry, it often reappears in proposals for new systems, allowing industry to claim the credit.

It was also pointed out that the defense laboratories are often criticized for not being the academic equivalent of DOE's national laboratories. However, the participants noted that the DOD labs were not established originally as large national laboratories, with the goal of being preeminent in numerous areas of research. According to the participants, the defense laboratories were established to fulfill three primary missions. First, to be leaders in specific areas of long-term, high pay-off research, including research in defense-related enabling technologies; second, to provide leadership in developing technologies needed for specific defense applications, while assuring the appropriate elements of DOD's technology base are involved; and third, to provide in-house technical expertise to OSD and the three Services.

Finally, during the course of the opening discussion, some participants suggested that Congress and DOD have not acted on behalf of the laboratories because they question the credibility of past studies which continue to reach the same findings. They argued that if the laboratories were facing similar problems in 1961, and have continued to successfully fulfill their missions over the past 30 years, as claimed by the Services, then the problems must not be critical. Some of the participants argued that perhaps Congress and DOD have not intervened on behalf of the laboratories because they are not convinced that these problems are actually threatening the viability of the laboratories.

Nevertheless, the group agreed that although the challenges confronting the labs may be comparable to those in 1961, the environment in which the labs must operate is not. Several of the participants went so far as to suggest that "time may be running out" for the DOD laboratories. They asserted that if Congress and DOD fail to address the challenges facing the laboratories within the next five years, some of the laboratories may not be capable of assisting the Services in meeting their national security responsibilities.



CHAPTER 4

WORKSHOP'S REVIEW OF OPTIONS FOR RESTRUCTURING THE DEFENSE R&D LABORATORY SYSTEM

This chapter presents the results of group consideration of three broad policy options that Congress might consider in order to meet the challenges facing the DOD laboratories. During this segment of the workshop, the participants were divided into three groups with each discussing the advantages and disadvantages of one option. Further, the participants discussed the extent to which that option could resolve the six major laboratory issues without compromising the overall mission of the DOD laboratories. The remaining portion of the chapter outlines the three options that were examined by the workshop participants, followed by each group's findings and recommendations for their respective option.

Another option that could have been discussed, but was not, is to do nothing and allow the laboratories to operate as they have in the past. Given the purpose of the workshop, the likely continuation of Federal budgetary constraints, and the rapidly changing international environment, such an option was not treated.

OPTION I: INSTITUTE INCREMENTAL IMPROVEMENTS FOR THE DOD LABORATORY SYSTEM WITHIN THE CONSTRAINTS OF THE CURRENT CIVIL SERVICE GUIDELINES

BACKGROUND AND ANALYSIS

The DOD laboratories are Government-owned and Government-operated facilities (GOGOs), staffed primarily by Federal employees (70 percent civilian and 30 percent military) who are subject to the rules and regulations of the Federal Office of Personnel Management (OPM). Many of the laboratories are small, with well-defined missions, such as the Army's Cold Regions Research and Engineering Laboratory; several of the laboratories are large and diverse, such as the Naval Research Laboratory or the Air Force's Rome Air Development Center.²⁴

In order to address some of the personnel issues facing the laboratories, Congress has allowed OPM to initiate a number of experimental personnel projects to demonstrate proposed personnel management improvements in the Government. The Civil Service Reform Act of 1978 authorized the use of experimental personnel projects in the Federal Government. Over the last decade, one of the most highly publicized personnel experiments has been carried

²⁴ Portions of this section are adapted from U. S. Congress. Office of Technology Assessment. Holding the Edge: Maintaining the Defense Technology Base. Apr. 1989.

out in two Navy laboratories, the Naval Ocean Systems Center and the China Lake Naval Weapons Center (NWC), with two other Navy laboratories acting as controls.

The China Lake experiment, as it is usually referred to, breaks with the standard Federal personnel system in four ways:

- (1) it separates career paths, with distinct paths for scientists and engineers on the one hand, and technical or administrative specialists, on the other;
- (2) it consolidates 15 General Schedule (GS) grade classifications into no more than 5 broad "pay bands" corresponding to career paths;
- (3) it establishes abbreviated position descriptions and standards; and
- (4) it seeks to provide a much closer link between pay and performance.

Although OPM had originally set up the experiment to run five years, Congress has extended it until 1990.

Both OPM and a General Accounting Office (GAO) study found that, in general, the project had essentially succeeded in doing what it was intended to do. Compared to the two control sites, personnel at the demonstration sites found the experimental system to be more flexible than the Navy's conventional performance appraisal system. That is, due to the broader pay bands, managers could offer new employees higher starting salaries and distribute pay increases based on performance as judged by managers. However, even though China Lake has been deemed a success, Congress has not allowed it, primarily for cost reasons, to be adopted by other DOD laboratories.

Further, one can conceive of small-scale improvements to the current system even without instituting China Lake system performance-based pay. Since the establishment of the China Lake experiment, OPM has authorized mechanisms that make it easier for agencies to hire qualified professional staff. For example, laboratories can now apply to OPM for authority to hire engineers directly, without screening by OPM. Also, OPM allows the laboratories to negotiate starting salaries with highly qualified candidates at GS-11 and higher.

Nevertheless, the China Lake experiment and recently initiated flexible OPM personnel policies do not address the problem of providing outstanding scientists and DOD laboratory directors and managers with salaries that are competitive with universities and the private sector. Some believe the NIST personnel demonstration project, which is similar to China Lake, might better address this concern. Directors of the NIST project have been given the authority to adjust the salaries that they pay their scientists and engineers to match those paid by the private sector for comparable work. Consequently, NIST salaries are already among the highest at Federal laboratories. However, NIST was not appropriated additional funding to support any salary increases resulting from the demonstration project performance review. Thus, increases in average salaries have led to reductions in staff and/or program expenditures.

Members of Congress have introduced bills aimed at raising the compensation of top scientists in the Federal Government. Senator Bingaman attached the Compensation for Critical Employees amendment to the FY 1990 Defense Authorization bill. The amendment would allow the Secretary of Defense to designate 500 science and engineering positions as critical and to provide compensation of up to \$135,000 for those positions. In the past, Senator Bingaman has been unsuccessful in getting Congress to expand the China Lake experiment, as well as to provide higher pay for critical science and engineering positions. It is unlikely that the full Congress will approve this amendment as well, primarily because Congress, and to some extent OPM, is reluctant to establish yet another separate pay schedule for a select group of individuals within the Federal Government.²⁵

Finally, it is important to keep in mind that all personnel experiments are supposed to be "revenue neutral." This means that the agency cannot request any additional funds to implement the experiment. If Congress continues to insist on this prerequisite, it appears that Government-wide pay adjustments will not be likely.

In the area of management and procurement, the 1983 Packard report recommended amending existing laboratory regulations and DOD directives which would provide laboratory directors with greater accountability for their laboratories. This would include appointing the director for a specific length of time, with the option of extending or prematurely terminating the appointment based on the performance of the director. However, if this were adopted, lab directors would have to be given direct authority for all laboratory activities, including support services. This could include such changes as raising the \$200,000 limit on local approval for new facilities.

Another incremental modification could involve Congress in adopting biennial appropriations for DOD's R&D programs. Biennial appropriations might decrease the considerable amount of time DOD personnel have to spend preparing, reviewing, and defending annual budgets. It would also add stability and efficiency to laboratory activities by providing known funding levels for future laboratory programs.

Multiyear budgeting could allow DOD and Congress additional time to consider laboratory activities in terms of strategic options. Furthermore, rather than making funding decisions based on isolated program elements, an overall strategic budgeting approach might help Congress understand the trade-off implications of different laboratory programs.

There are disadvantages to multiyear funding that until recently have predominated in congressional decisions. Congress would be giving up some of its annual oversight powers, primarily in the area of budgetary actions. Further, if budget projections proved to be inaccurate, it could be difficult to make mid-cycle revisions, or to accommodate changes in budget priorities.

A final consideration under this option would be to give laboratory directors greater flexibility to distribute funds once they are

²⁵ This amendment was eventually dropped from the FY 1990 defense authorization bill.

available. One approach that could be considered is to have the Services adopt the Navy's Naval Industrial Funding (NIF) approach. NIFs are designed for activities that provide services and/or products that can be charged to customers in a fashion similar to private industry. This approach allows laboratory management more authority and information to make management decisions. NIF also includes an Asset Capitalization Program (ACP) approved by Congress in 1983, which enables equipment to be purchased using an overhead charge to customers.

FINDINGS AND RECOMMENDATIONS OF GROUP I

The group began their comments with a general observation that it is important to remember that the DOD laboratories are not homogeneous, and consequently an overall generic solution is not viable. The group then proceeded to make a number of recommendations in the following five broad categories:

1. incentive structures;
2. facilities;
3. bureaucracy/administration;
4. mission; and
5. visibility of science and technology programs.

1. THE LABORATORIES' INCENTIVE STRUCTURE

a. This group concluded that since the Office of Personnel Management and the General Accounting Office have declared the China Lake experiment a "success", the China Lake personnel program should be implemented in all of the DOD laboratories.

However, the group indicated that just raising the average salaries in the laboratories was not the solution to the laboratories' personnel problems. They indicated that any new personnel system must provide the laboratory directors with the flexibility to tie individual compensation to performance, rather than primarily to seniority. This would allow the directors to increase the salaries of some employees, while "weeding out" those individuals who are overpaid and not performing. The group also indicated that greater flexibility in the area of personnel would allow laboratory directors to hire new people when the laboratory had to move into new areas of research. Finally, they stated that the Government should stop adopting personnel regulations that are "abusive" to its own work force in the labs. The participants cited the most recent revolving door and conflict of interest legislation as examples.

b. The group also suggested that Senator Bingaman's Compensation for Critical Employees amendment to the FY 1990 Defense Authorization bill be adopted by Congress and implemented across all of the DOD laboratories.

According to the group, this recommendation addresses the concern of recruiting and retaining some of the most experienced and accomplished managers and S&Es to work in the DOD laboratory system. Currently, with the present salary disparities, DOD is not able to compete successfully with the private sector for top S&Es to work in their laboratories.

The group noted that Senator Bingaman's proposal would not address the compensation concerns of a large number of program managers and senior scientists (GS-14s and GS-15s) in the laboratories. The Senator's proposed salary amendment would affect only 500 SES positions across all the R&D laboratories, and falls far short of meeting the needs of this much larger group. The participants indicated that in order to increase their salaries, program managers and senior scientists had to apply for a limited number of SES positions, or take jobs in the private sector. They indicated that some provision would have to be adopted which would allow their salaries to become more competitive with the private sector.

The group was also cautious as to how Senator Bingaman's amendment should be applied across DOD, if adopted by Congress. They indicated that the suggested pay level (up to \$135,000) not be uniformly adopted across all the laboratories' SES positions. They recommended that the laboratory directors be given the authority to determine what the appropriate pay increase should be for each SES position in their laboratory. In some cases, no pay increase might be appropriate.

c. The participants noted other incentives that must be present in order to attract and retain outstanding scientific talent. These include, but are not limited to, such things as a challenging mission, the availability of modern research equipment and facilities, and an opportunity to work with recognized experts in their respective field of science. They indicated that in too many DOD laboratories these opportunities do not exist.

d. They also recommended that DOD support the Packard study recommendation of providing laboratory directors with up to 10 percent of their annual laboratory budget for discretionary research.

The In-house Laboratory Independent Research (ILIR) funding and Independent Exploratory Development (IED) are intended to fulfill this discretionary R&D function. However, according to some group members, ILIR and IED funding have been both inadequate and, in some instances, non-existent in some laboratories.

The group endorsed the recommendation of the 1983 Federal Laboratory Review Panel, chaired by David Packard, that "at least 5 percent, and up to 10 percent, of the annual funding of the laboratories should be devoted to a program of independent research and development," and that this money should be used at the laboratory director's discretion, within the guidelines established by OSD and the Services. It should be noted that some members of the group were reluctant to recommend a specific percentage. They felt that in some laboratories, given their particular mission, up to 20 percent of the lab's budget might be more appropriately used for ILIR and IED activities.

e. Finally, under the rubric of incentives, the group felt that DOD should draft a statement that recognizes that people are the most important resource in the laboratories. They said that individuals, especially in the Federal labs, need to know they are important and appreciated. DOD should actively endorse personnel procedures that recognize that without good people the laboratories could not meet their important national security responsibilities.

2. LABORATORY FACILITIES

a. Protect the Navy's Asset Capitalization Program (ACP) scheduled to be terminated next year. The group was unanimous in recommending that the ACP not be canceled, but allowed to be adopted by the Army (which used to have a similar program for its labs) and the Air Force. The Air Force representatives indicated that buying new equipment was not a real problem in their labs. Nevertheless, the entire group felt that the potential suspension of the ACP was a giant step backward.

Representatives from the Navy said that since 1983, this program has increased the amount of money available to purchase important new research equipment for the laboratories. The Army participants indicated that they would like to renew their ACP. The current Army approach is to appropriate a single amount of money for new research equipment, for which all the laboratory directors have to compete. In times of tight budgets this fund usually is cut first, or taken and used for other needs.

The Navy ACP allows its laboratory directors to recover equipment costs over the life of the asset by including depreciation costs in the rates charged to their customers. The availability of the ACP money gives the laboratory director greater flexibility in purchasing needed research equipment. According to the group, this approach more accurately reflects the level of need within each laboratory; primarily because the amount of money available for laboratory equipment is directly related to the amount of contract work each Navy lab is capable of obtaining.

b. The members of this group recommended the establishment of a separate process for funding the modernization and construction of new laboratory facilities, exclusive of the Military Construction (MILCON) account. They indicated that in the MILCON account, housing and other facilities are always given higher priority than R&D facilities. It was pointed out that at the current rate of funding, it will take over 200 years to replace the R&D facilities currently identified as needing replacement or refurbishment.

The group noted that modern research facilities are a crucial factor in recruiting and retaining good scientists. These facilities are also needed to exploit new technologies, provide for environmental protection, and development of the latest weapon systems and new platforms.

c. The group recommended that the amount each laboratory director can spend for facilities within the laboratory be increased from \$200,000 to \$2 million. Allowing the laboratory directors authority to spend up to \$2 million would greatly improve DOD's ability to meet the future needs of the laboratories.

3. BUREAUCRACY AND ADMINISTRATION OF THE LABORATORIES

a. The group indicated that the laboratories are operating under significant oversight restrictions; there is too much micromanagement emanating from both Congress and DOD. Laboratory directors should have greater flexibility to target promising new research areas and, if necessary, hire people to pursue such research. Nevertheless, the group asserted that the budget process and DOD micromanagement usually will not allow this to happen. However,

because of insufficient information, the group made no recommendations in this area.

b. The group stated that Congress and DOD need to streamline procurement rules for the laboratories. The group members pointed out that the R&D laboratories are currently included in the Competition In Contracting Act (CICA) full and open competition rules. They argued that S&T activities in the laboratories should not be subjected to the same procurement regulations for buying tanks and planes.

According to the group, this requirement has dramatically slowed down the purchase of specialized equipment and supplies, as well as the laboratory's solicitation and awarding of R&D contracts. They indicated that the same procedures for procuring high-cost, high-risk, complicated weapon systems, should not be applied to low-cost, relatively low-risk R&D procurement. They indicated that individually, the adoption of each new procurement regulation probably made sense. However, over the years, the accumulation of each separate regulation has led to procurement "gridlock," with little assurance that tax dollars are now being spent more judiciously.

4. THE MISSION OF THE DOD LABORATORIES

a. They indicated that in response to the 1983 Packard report, the laboratories should develop a clear mission statement. One of the participants asserted that the laboratories need to convince Congress that they do important work. One way of doing this is to develop a clear mission statement. Several participants noted that Congress should not preserve a laboratory because "it is the right thing to do." The labs should be able to demonstrate to Congress and top leaders in the Pentagon that they have an important mission to fulfill. The group indicated that if a laboratory is unable to do this, then it should probably be closed.

b. The group also asserted that DOD and Congress should acknowledge that some laboratories have multiple missions. However, they indicated that it is up to laboratory management to clearly differentiate between the separate missions. Further, the staff should agree with and understand the different missions of the laboratory, otherwise the laboratory may lack a consistent sense of direction.

Finally several of the participants indicated that the term "laboratory" does not always accurately reflect the mission and role of the labs. They said that both DOD and Congress often do not realize that many of the laboratories are really "multi-functional engineering centers," that happen to have a small basic research and applied research operation.

c. This group also felt that the importance of R&D, and its relationship to DOD's overall mission, needs to be more clearly stated. This touches on the issue of greater visibility of the laboratories and the military R&D community's failure to articulate the role the laboratories play in the development of different weapon systems. Several of the participants asserted that key leaders in the Pentagon or the Services do not see, and therefore often fail to appreciate, what the labs produce. Too often these leaders see a par-

ticular system built by a DOD contractor, but are not made aware of all the contributions the defense laboratories made to get that system on-line.

5. THE GROUP'S FINAL RECOMMENDATIONS ADDRESSED THE PROBLEM OF POOR VISIBILITY FOR DOD'S RDT&E PROGRAMS

a. The group felt that a high level advocate for RDT&E, within OSD and the Services, is essential. The absence of an advocate could threaten many of the laboratories' programs if DOD's RDT&E budget continues to decline. According to the group, DOD currently lacks a strong defender of its overall laboratory programs. A strong advocate would have two primary responsibilities: (1) to present a comprehensive review and summary of accomplishments of the DOD laboratories to Congress; and (2) to act as a strong proponent for the labs within the Department of Defense.

b. The group also indicated that science and technology should have a voice at the budgetary decision level within DOD. As a result of the Goldwater-Nichols Act of 1986, DOD has reorganized the management of its RDT&E activities. The Act abolished the Office of Under Secretary of Defense for Research and Engineering (USDR&E) and replaced it with the Under Secretary of Defense for Acquisition (USD/A). The legislation also recreated the Director of Defense Research and Engineering (DDR&E), who reports to the USD/A.

Consequently, the group pointed out, for the first time in many years, the individual solely responsible for RDT&E (formerly the USDR&E) will no longer have direct access to the Secretary of Defense, and will not participate in final DOD budget deliberations. With a procurement budget several times larger than the RDT&E budget, the group is afraid that general science and technology concerns will take a back seat to the USD/A's broad acquisition responsibilities.

c. The group recommended that the Defense Resources Board (DRB) have scientific representation. The DRB was established in the early 1980s in recognition of the two separate cycles in planning for defense resources (one for the five year defense plan, and another for the acquisition of weapons). The DRB serves as a mechanism to integrate all of the various planning decisions at one point within OSD.

OPTION II: TREAT DOD's R&D ACTIVITIES DIFFERENTLY BY ALLOWING SOME OF THE LABORATORIES TO CONVERT TO GOVERNMENT-OWNED, CONTRACTOR-OPERATED FACILITY

BACKGROUND AND ANALYSIS

In its 1987 report, the Defense Science Board suggested that "where existing Government [DOD] laboratories are not performing well, conversion to a Government-owned and contractor-operated laboratory has some attractive properties."²⁶ The report did recognize that such a conversion could cause significant disruption, as well as political opposition. Nevertheless, the DSB indicated that

²⁶ Defense Science Board 1987 Study on Technology Base Management. p. 15.

in some circumstances, such a conversion may be in the best interest of the laboratory.

Government-owned, contractor-operated (GOCO) laboratories were established during and following World War II as a way to bring top scientific talent to bear on crucial national security problems. The contractor-operated approach was chosen to avoid the civil service bureaucracy and to expedite solving important science and technology problems. The Atomic Energy Act of 1946 and 1954 expressly authorized Federal agencies to contract with industrial and academic organizations to manage their laboratories.

One important question to examine is the extent to which GOCO laboratories become more like Government laboratories, since they must account for public funds. The evidence suggests that there is no simple answer. Over the past few years, there appears to have been a gradual shift toward DOE forcing its laboratories to conform more closely to more stringent legislation and regulation.

The view from DOE headquarters and language in DOE funding bills indicates that the laboratories' GOCO status does not exempt them from complying with the spirit of Federal policy. The GAO's Deputy Comptroller General indicated that the DOE laboratories must comply with "the Federal norm."²⁷

Clearly, one area where the laboratories set their own policy is in personnel management. The personnel system at each DOE laboratory reflects that of the prime contractor. There are no assigned personnel slots in the laboratories and top technical people can earn up to \$95,000. Senior executives earn between \$100,000 and \$150,000, approximately twice what their counterparts at the military laboratories earn.

In the area of procurement, the evidence is not so clear. While DOE laboratories like Sandia (which is operated by AT&T) follow AT&T procurement and personnel management policies, Sandia is also bound by a number of Federal regulatory constraints. These include adhering to DOE acquisition regulations and directives of the Federal Acquisition Regulation, the Buy American Act, and prevailing-wage legislation on federally subsidized construction contracts. The laboratories also fall under the Federal Contract Compliance Programs.

On the other hand, the laboratories are exempt from a number of requirements that bind Federal agencies. These include formal advertising, set-aside programs, and the Competition and Contracting Act, about which the DOD laboratories have bitterly complained. The laboratories also are exempt from the Brooks Act, which governs the procurement of computers and telecommunications equipment. An internal NRL study indicated that for some DOE facilities, the time it took to procure a \$100,000 piece of equipment was about equal with Federal laboratories. The NRL study also indicated that DOE and DOD laboratories required almost the same amount of time to respond to multimillion dollar contracts.

In some respects, the GOCO funding mechanisms appear to be more flexible than DOD's laboratories. DOE allocates funds to each institution annually, based on its mission and the size of the staff.

²⁷ Decision of the Deputy Comptroller General in protest of Piasecki Aircraft Corp. (B-190178, July 6, 1978), p. 10.

But unlike the DOD laboratories, DOE laboratories do not receive their funds in one lump-sum. Instead, they receive money from hundreds of separate sources including other DOE components or headquarters program offices, with specified agreements for each task. In some ways, this resembles NIF funding described earlier. DOE-sponsored work is funded by "no-year" money, which is available until spent. DOD laboratories must obligate all their funds within the fiscal year that it is appropriated.

At the present time, it is not apparent that DOE's GOCOs have a distinct advantage over DOD's laboratories in improving their facilities. Approval for capital improvements are made outside of the laboratory, usually by Congress. It is certainly not apparent that defense-related GOCOs would do any better under such an arrangement. One approach might be to operate under a Unified Budget Concept. The contractor then could shift money among personnel, facilities, etc., as deemed necessary.

Another important consideration is to what extent GOCOs eventually become more like Government laboratories since they must account for public funds. Growing evidence suggests that with time, GOCO laboratories tend to become more like Federal laboratories because they receive Government funds. For obvious reasons, no Federal agency can give its contractor-operated facilities complete freedom to set policy within the framework of the laboratories' mission. Further, DOE's delegation of "inherently Government functions" to its national laboratories does not violate this premise, primarily because an agency can delegate those functions, while holding its contractors to strict accountability.

This raises the issue of how successful DOE has been in overseeing the operations of its contractor-operated laboratories. Although the DOE operations offices are supposed to oversee the laboratories and weapons production facilities, evidence suggests that the oversight may have not been stringent enough. Perhaps the problems are centered at the production facilities and not the national laboratories. Nevertheless, if currently serious production facilities concerns prove to be accurate, Congress may decide to tighten its oversight of DOE's laboratories.²⁸

Clearly there are some advantages and disadvantages for converting to a GOCO arrangement, although both are shrouded in uncertainty. One issue to be addressed is how much improvement would have to be gained in non-personnel areas, in order to justify the costs of switching to a GOCO arrangement. A qualitative uncertainty is how well a GOCO would work in the DOD environment.

FINDINGS AND RECOMMENDATIONS OF GROUP II

The group opened its discussion by deciding to examine systematically the extent to which the proposed GOCO option would adequately address the six issues raised in the workshop briefing paper. Consequently, the group initiated its discussion by examin-

²⁸ There has been limited congressional oversight of the DOE laboratories since the Joint Committee on Atomic Energy was abolished in the mid-1970s.

ing the extent to which converting a DOD laboratory to a GOCO operation would help produce a well defined mission statement.

1. TO WHAT EXTENT WOULD CONVERTING TO A GOCO ARRANGEMENT HELP THE LABORATORIES DEVELOP A CLEAR MISSION STATEMENT?

The group began by evaluating the laboratory mission statement contained in the workshop briefing paper. On the whole, the members indicated that the mission statement was too narrow. They asserted that it did not appear to include all the various activities that are undertaken by the Services' laboratories. Like the previous group, this group also felt that the laboratories are more research and development centers with the emphasis on development.

The group then agreed that the DOD laboratory system is comprised of three different types of laboratories: (1) corporate laboratories; (2) laboratories that are primarily responsible for producing a particular product; and (3) laboratories that are primarily involved in acquisition activities.²⁹ In some cases, a laboratory could be engaged in all three of these activities. Such laboratories are referred to as full spectrum laboratories. The group indicated that corporate laboratories would probably be most suited for conversion to GOCO labs, with a product lab less so. They felt that acquisition laboratories would not be good candidates for a GOCO conversion.

The group stated that it is probably true that some laboratories are no longer sure of their mission. Nevertheless, they concluded that converting to a GOCO probably would not help this situation. Accordingly, the group indicated that improving a laboratory's mission statement should not be justification for converting to a GOCO.

2. TO WHAT EXTENT WOULD CONVERTING TO A GOCO ARRANGEMENT HELP THE LABORATORIES ADDRESS SALARY CONSTRAINTS THAT SUPPOSEDLY INHIBIT THE RECRUITING AND RETENTION OF TOP SCIENTIFIC AND MANAGEMENT TALENT?

There was unanimous agreement in the group that implementing the GOCO option would go a long way in helping to solve the pay differentials between the DOD laboratories, and the university and private sector laboratories. This was especially important since a couple of the participants claimed that the pay differential issues may now be threatening the long term viability of some DOD laboratories.

The group indicated that the pay gap has dramatically hampered the Services' ability to hire and retain top scientific talent for their

²⁹ A *corporate laboratory* is usually a large lab, employing more than 1,000 scientists and engineers engaged in a variety of broad research and development activities. The Naval Research Laboratory is a good example of a DOD corporate laboratory. A *product laboratory* is usually responsible for the development of one or more products, such as the Army's Tank and Automotive R&D Center. The laboratory is usually responsible for developing a prototype and then turning the prototype over to industry for full scale development and production. The laboratory's research and applied research programs are focused on improving the technology associated with the lab's products. An *acquisition laboratory* is one which contracts-out, to defense contractors, the majority of its development activities including prototyping activities, rather than performing them in-house. Many of the Air Force laboratories fall under this category.

laboratories. For example, it was pointed out that the DOE national laboratories are able to recruit scientists and engineers that graduate in the top 10 percent of their class from the Nation's premier universities, (referred to by one person in the group as "tier I" universities). The workshop participants in this group contend that except in rare instances, DOD is no longer able to recruit scientists and engineers from this elite group of universities. According to the group, DOD laboratory managers are primarily hiring S&E graduates from what was referred to as the tier II and tier III universities.

The group identified two major personnel challenges that must be solved if the laboratories are to remain a productive contributor to DOD's RDT&E program. First, DOD must adopt a compensation system that enables laboratory directors to hire some top S&E graduates from the tier I universities. One laboratory director at the workshop commented that the top 2 to 5 percent of the scientists dictate the research direction for the entire laboratory.

Secondly, the group recommended that the technical directors have the ability to pay a few top researchers salaries that are competitive with their industrial and university counterparts. Currently, the private sector is "raiding" DOD's top S&E talent, primarily by paying them up to twice as much as they were previously earning with DOD.

OPM has given "direct hire authority" to DOD laboratory representatives in areas of research where DOD currently has manpower shortages. Despite cutting the time in half for hiring S&Es (from 20 weeks to 10 weeks), salary disparities continue to prevent the hiring of top scientific talent.

One participant quoted an Air Force study that indicated that median starting salaries for S&Es are about 25 percent lower in Federal laboratories than in industry or Federally Funded Research and Development Centers (FFRDCs). According to this individual, this shows that industry, universities, and FFRDCs are willing to pay more to attract and retain the top people who will be the future laboratory leaders. He concluded that the current Federal salary structure is a clear prescription for mediocrity in the Government labs. No one in the group challenged this observation.

According to this group, the issue of salary differential is most pronounced in the ranks of technical directors and program managers and their counterparts in the GOCOs. Technical directors and program managers in most of DOE's GOCOs earn more than twice as much as their DOD counterparts. According to the group, this situation precludes DOD from attracting innovative, technical entrepreneurs from the private sector.

The group did agree that converting the labs to a GOCO arrangement offers improved salary and benefits, speed of hiring, better people, and greater flexibility in deploying personnel throughout the laboratory. Nevertheless, they did identify several major concerns associated with such a conversion.

1. *Costs:* if the conversion was to be carried out without allowing for additional salary costs (i.e. cost-neutral), then the laboratories would have to be given greater flexibility in reducing and consolidating personnel, as well as decreasing the pay for others.

2. Military presence in the laboratory: DOD contends that it must have military personnel working in their laboratories. A conversion to a GOCO facility, operated by a university or a private sector company, would have to occur with the understanding that the military's S&Es must have the same level of laboratory access under a GOCO arrangement.

3. Salary differentials: the group raised the issue of what problems might develop with DOD S&Es, working side-by-side on the same research problems as their private sector counterparts receiving salaries considerably higher than theirs.

4. Revolving door restrictions: the group also felt that before any conversion took place, DOD would have to determine the extent to which these restrictions might prevent an employee from moving into a management position at corporate headquarters.

3. TO WHAT EXTENT WOULD CONVERTING TO A GOCO ARRANGEMENT HELP THE LABORATORIES ADDRESS THE NEED TO IMPROVE THEIR RESEARCH FACILITIES?

This group agreed that facilities are a major problem across the DOD laboratory system. A representative from the Air Force indicated that over the past several years the labs have been involved in a concerted effort to upgrade their facilities. Nevertheless, the group stated that DOD is moving into the "micro" research environment, but getting MILCON funding to meet the facility needs for such exotic research is almost impossible. One participant noted that a general might understand the need for an electronic warfare laboratory. However, requesting money to build a laboratory to conduct research in a "micro" environment is usually a waste of time.

A couple of participants asserted that some GOCO laboratory directors are allowed to lobby Congress directly to persuade Members to support funding for important research facilities. On the other hand, DOD laboratory directors are rarely allowed such direct access to Congress.

The group concluded that the condition of the overall laboratory facilities would not necessarily benefit from a GOCO conversion. At least in the facilities arena, the GOCO option may provide a slight political advantage, but does not provide any real overall advantage.

4. TO WHAT EXTENT WOULD CONVERTING TO A GOCO ARRANGEMENT CONTRIBUTE TO A MORE PREDICTABLE FUNDING ARRANGEMENT?

Converting to a GOCO in order to alleviate funding fluctuations would be a mixed blessing, according to this group. The group concluded that funding fluctuations would probably still remain even after converting to a GOCO arrangement.³⁰

Usually, contract arrangements between the GOCOs and the contractors that manage them vary within narrow limits. Initially, a broadly stated management and operation contract is negotiated, providing a base level of funding, usually over a five-year period.

³⁰ The group did not take time to discuss what was meant by the concept of funding fluctuations.

However, on an annual basis, the GOCO laboratory directors negotiate a much narrower work agreement, with the sponsoring agency (in this case DOE) providing the funds to fulfill that agreement.

The group noted that such an arrangement must have a strong commitment from the contractor operating the laboratory if it is to be successful. Indeed, until recently, many of the DOE national laboratories have been managed and operated by the same contractor since World War II.

Although the group indicated that a five-year funding commitment was an improvement over their annual budget cycle, they were concerned that a specific time frame implied a potential termination date for the relationship. In other words, the group was uncomfortable with the lack of a guaranteed continuous relationship (like the DOD labs enjoy as part of the Federal laboratory system) with the contractor managing the lab. The participants noted that if the contractor decided to terminate the contract, there is no guarantee that another contractor would be found to manage the laboratory. Such a predicament could actually force the closure of the facility. Some members of the group indicated that if DOD could not find a contractor to operate and manage the lab, then perhaps it should close down.

5. TO WHAT EXTENT WOULD CONVERTING TO A GOCO ARRANGEMENT REDUCE BURDENOME PROCUREMENT REGULATIONS?

The members of the group concluded that GOCOs appear to have small advantages in the area of procurement. The group noted that GOCOs are not exempt from complying with the "spirit" of Federal procurement policy. They pointed out that the GOCOs are bound by a number of DOE regulatory constraints, such as specific procurement regulations and directives, including FAR, as well as the Buy America Act.

As an example of their advantage in procurement, GOCOs do not have to conduct full and open competition. Rather, GOCO laboratory managers are allowed to select a minimum of five organizations to compete for a procurement contract, while DOD is not allowed to restrict the competition at all.

Nevertheless, the group was not sure that the small advantages in procurement activities were sufficient to justify conversion to a GOCO. The group noted that perhaps 15 years ago a conversion might have provided a significant advantage, but not today. Further, they asserted that over the past several years, Congress and DOE, have subjected GOCO procurement activities to greater scrutiny. Further, the group noted that recently discovered management problems at DOE's weapons production facilities may accelerate this phenomenon.

6. TO WHAT EXTENT WOULD CONVERTING TO A GOCO ARRANGEMENT HELP ALLEVIATE A MANAGEMENT SYSTEM WHICH CAN BURDEN LABORATORY DIRECTORS AND TOP MANAGERS WITH A MORASS OF RULES AND REGULATIONS?

Clearly, GOCOs have greater capability of hiring S&E personnel from the top universities, to pay salaries comparable to industry

and the universities, and to reduce and move staff when new areas of research had to be pursued. However, the group indicated that over the years, the differences between contractor-operated laboratories and Government-operated laboratories have been reduced, primarily because each must be held accountable for the expenditure of public funds.³¹

The group ended its discussion by concluding that the only outright advantage to GOCOs appears to be in the area of personnel. They indicated that this is an extremely important advantage, but due to recent DOE weapon facilities problems, GOCOs may be headed for tighter congressional oversight. The group also noted that the overall philosophy of how to manage and oversee the operation of a GOCO was very much in flux. At best, DOD may now be aiming at a moving target.

Finally, the group advanced several issues or concerns to be confronted if DOD's laboratories actually attempt to convert to a GOCO arrangement.

1. All the Services would have to agree that a GOCO conversion should happen.

2. The cost of a conversion must be addressed. It would not be cheap. For example, under what arrangement would the new laboratory contractor "buy out" the remaining employees' Government retirement benefits?

3. The group felt that not all the laboratories would be good candidates for converting to a GOCO arrangement. They asserted that the Services' corporate and product laboratories might be the best candidates.

4. The military would have to find enough qualified contractors willing to operate the various DOD laboratories. Several in the group were concerned that DOD would not be able to find contractors to operate all of its laboratories. The group suggested that those laboratories unable to secure a contractor should be closed.

5. Any potential contractor for a laboratory would have to assume a continued military presence, probably at current levels.

6. The bottom line is, if a laboratory really wanted to convert to a GOCO it could do it, but support at all levels, including DOD and Congress, would be necessary.

OPTION III: CLOSE SOME LABORATORIES, AND CONSOLIDATE OTHERS, WHILE MODIFYING MANAGEMENT ARRANGEMENTS FOR THE REMAINDER

BACKGROUND AND ANALYSIS

It might be argued that with the growth in private sector R&D capabilities, and a declining threat environment, DOD no longer needs 72 R&D laboratories.³² Given the likelihood of shrinking de-

³¹ A recent Office of Technology Assessment (OTA) report indicated that it is very difficult to acquire operations and management information from DOE's GOCO facilities. This is partly due to the contractor's reluctance to release such information and DOE's tendency to treat it as proprietary data. However, according to OTA, some evidence suggests that management restrictions and acquisition lead times at some DOE labs are equivalent to larger DOD laboratories. *Holding the Edge: Maintaining the Defense Technology Base*. May 1989.

³² The Office of Management and Budget has issued circulars barring agencies from performing activities that could be done in the private sector.

fense budgets, closure and consolidation may be more palatable now than anytime since the early 1970s. Such activities have occurred in the past. For example, in the early 1970s, the Air Force initiated a major reorganization of its laboratories, converting its Cambridge Research Laboratory from basic research to an "exploratory development" institution, closing the Aerospace Research Laboratory at Wright-Patterson AFB, and eliminating one of its contract research centers. NASA closed its Electronics Research Center and transferred the facility to the Department of Transportation, and the Army's Fort Detrick became a contractor-operated facility working for the National Institutes of Health.

Short of actually closing laboratories, the Services could keep them open, but encourage the laboratories to seek other sponsors as budgets tighten. However, if some of the laboratories were unsuccessful in finding sponsors, the Services would have to decide whether they would be better off cutting all laboratory budgets 20 percent or closing 20 percent of the laboratories, for example.

If the Services chose the latter, one option they could consider is to establish one corporate laboratory while restructuring their full spectrum weapons development centers. A corporate laboratory could perform the majority of the technology base work for the Services, generate research concepts, and nurture them to the demonstration phase. Meanwhile, the remaining engineering and development centers would have to continue to establish priorities in their development programs, maintain close contact with the corporate lab, and continue to transition technology into new systems.

While restructuring the laboratory system, the Services could implement a GOGO-GOCO management hybrid scheme. Under this arrangement, the laboratories would remain federally operated, but with centralized management that could contract-out support services. Contracting-out would allow the laboratories to pay market rates for support services; give the laboratory directors greater flexibility in hiring workers and dismissing them when they were no longer needed; and bring in professionals who would not otherwise work for the Government. For example, laboratories could contract-out facilities management, supply operations, and financial and administrative processing. Scientists and engineers would remain Federal employees. To improve the salary situation, the laboratories could adopt the China Lake model and/or seek special salary rates, similar to those granted to medical doctors at NIH and the Uniformed Services University of the Health Sciences (USUHS).³³

Finally, any discussion involving the closure or reorganization of the laboratories has to address the political realities surrounding the closing of any military facility. Many people have commented that while it may be difficult to open a laboratory, it is almost impossible to close one. A recent model that might be employed to decide which laboratories should be consolidated or closed, while helping to avoid political pitfalls, might be the military base closure procedure passed by Congress (P.L. 100-526).

³³ Existing law (Code 10, Sec. 2113, para. f.) allows doctors who are civil servants, working for the USUHS, to be paid in excess of \$100,000 per year to reflect medical salaries at fully accredited universities.

FINDINGS AND RECOMMENDATIONS OF GROUP III

Overall, this group concluded that DOD and the Services have a laboratory system that has evolved over the last 150 years. The current laboratory arrangement is an accident of history, a "fossil." The group stated that no one would purposely design the current DOD laboratory system. They noted that any consolidation or restructuring of DOD's current laboratory arrangement must keep this fact in mind, as well as Service "unique" needs and the process each utilizes for systems acquisition.

However, the group stated that before any restructuring of the laboratories can occur, DOD and the Services must work together to develop an overall vision for the defense laboratory system. Restructuring of the laboratories would involve consolidating and terminating some labs, as well as redirecting and strengthening the remaining laboratories. Of these four actions, consolidation and termination would be the most difficult to achieve, but must be confronted if true reform is to be achieved.

The group said that it is possible to close some DOD laboratories--it has been accomplished in the past, and can be done in the future. However, they warned against a piece-meal approach. They indicated that DOD and the Services have to establish an overall strategy for its RDT&E program. Once this has been accomplished, then DOD and the Services should outline the role the laboratories can play in meeting that strategy. According to the group, this would require OSD and the Services to examine the strengths and weaknesses of its entire laboratory system.

The group indicated that such an examination might result in the restructuring of DOD's current laboratory system. They suggested this could be achieved by asking five basic questions:

1. What is it that DOD wants its laboratories to do?
2. What laboratory arrangement do DOD and the Services need to accomplish what they want done?
3. What has to be done to achieve the desired laboratory arrangement?
4. How do you implement the overall plan for restructuring?
5. Who in DOD and the Services would be responsible for implementing the plan?

The group asserted that before a laboratory could be closed, DOD would have to conduct an environmental impact study (EIS). The group contended this would not take long. However, a laboratory EIS would have to include both an environmental and economic analysis.

The group outlined some key elements that should be present if closure and consolidation are to be successful.

1. DOD must take care of the people in the laboratory. This could involve transferring some to other military labs, allowing others to retire, and working with others to find jobs at universities or in the private sector.
2. If possible, transfer the management and operation of the laboratory to a university, or to some entity in the private sector.
3. DOD might decide to allow some of its labs to close through attrition. The group asserted that a gradual shut down of a labora-

tory might draw less attention from Congress and strong interest groups in the military.

4. DOD could convert some of its laboratories to either GOCOs or FFRDCs. However, DOD would have to decide which of its labs should be converted, since, as group II indicated, not all of its labs are suited for such a conversion. Further, the group stated if a particular laboratory was not successful in converting to a GOCO or an FFRDC, it probably should be allowed to go out of business.

5. DOD might attempt to sell some of its labs to industry, or to transfer their operations to another Federal agency such as the Department of Energy.

6. DOD should take the lead in efforts to restructure its current laboratory system. The group asserted that if the military waits for Congress to act, it may be very unhappy with the results. The group asserted that Congress could end up closing or consolidating the wrong labs for the wrong reasons.

The group also pointed out certain things DOD should avoid when closing or consolidating certain laboratories.

1. DOD should avoid closing laboratories in "strong" congressional districts.

2. DOD should not just "walk-away" from a facility. Furthermore, some members of the group pointed out that Federal and State environmental laws prohibit DOD from abandoning a laboratory.

3. DOD cannot leave its laboratory people hanging. As indicated above, the Services will have to find a way to accommodate laboratory personnel affected by any closure or consolidation.

4. In other words, DOD will have to strike a deal which exhibits as many of the previous six attributes as possible.

The group debated whether it should forward a recommendation that would "really grab congressional attention" because another laboratory proposal containing the same concerns and recommendations would not attract sufficient congressional notice. Several of the participants indicated that Congress has been reluctant to initiate any significant laboratory reforms or restructuring efforts. Consequently, the group then discussed whether OSD and the Services should encourage Congress to establish an outside DOD R&D Laboratory Commission to study and make recommendations on the future of DOD's laboratories. The group indicated that the commission could operate much like the recent Base Closure Commission.

This idea generated much discussion, but was not completely endorsed by the entire group. Although the idea of an independent laboratory commission sounded interesting, the group was reluctant to recommend such an approach for fear that DOD and the Services would not like the commission's recommendations.

In essence, this suggestion represents a two-edged sword. On one side, it requires that DOD and the Services produce, for the commission, a vision and a consolidation proposal for the DOD laboratory system. The participants pointed out that the commission could choose to ignore or accept certain portions of DOD's proposal. On the other side, the proposal would require Congress to take some action on behalf of the laboratories. Some members of the

group suggested that Congress could either accept or reject the commission's recommendations en bloc.

FINAL RECOMMENDATIONS OF ALL THE WORKSHOP PARTICIPANTS

During the final portion of the workshop, all three groups were brought back together to present their individual findings, and, if possible, present some recommendations for the R&D Subcommittee. However, before developing any overall recommendations, the group identified five characteristics that successful laboratories possess.

1. A strong sense of purpose with a clearly defined mission.
2. The ability to hire and retain the very best researchers and engineers.
3. Excellent facilities, along with state-of-the-art research equipment.
4. Laboratory managers who operate and manage the laboratories with minimal interference.
5. A long-term and continuous close working relationship with their customers.

Several of the participants asserted that current law or Federal regulations prevent the DOD laboratories from exhibiting most, if not all, of these characteristics.

After presenting their findings, the workshop participants concurred on five proposals for the subcommittee's consideration.

1. All of the participants agreed that it was time to implement the China Lake personnel experiment across all of the DOD laboratories. Both GAO and OPM have declared this ten year "experiment" a success and reported it is time to allow other DOD organizations to adopt it. Many at the workshop felt this would help to address some of the laboratories' personnel concerns.

The participants were not sure whether congressional action would be necessary or if DOD could declare the China Lake experiment a success and implement across all the laboratories.

2. The participants indicated that the China Lake experiment does not meet the current salary needs of senior scientists and top level laboratory managers. Consequently, they indicated it was crucial that Congress provide a separate pay rate, of up to \$135,000, for top level laboratory managers and outstanding personnel in the laboratories. The participants felt that Congress could use Senator Bingaman's Compensation for Critical Employees proposal as a model. Again, the participants reiterated their belief that the recruitment and retention of the most experienced and accomplished scientists and engineers has become a serious problem and may be compromising the efficiency and effectiveness of the DOD laboratories.

3. Several of the participants indicated that simply adjusting the laboratory salary structure is not enough. They suggested that such an approach would result in a more expensive laboratory system, without improving the labs' overall performance. Many of the participants indicated that Congress and DOD should provide laboratory directors with greater authority to consolidate and reduce staff, as well as tie pay to individual performance and local

area salary levels. They concluded that without this authority the cost of compensation reform would be unacceptable.

4. The group recommended amending the existing procurement regulations as they pertain to S&T activities in the laboratories. The participants stated that it made little sense to require that procurement regulations, designed for buying F-14s, be equally applied for S&T procurement activities in the laboratories.

The participants indicated all these regulations have resulted in producing unacceptably slow procurement, which has increased costs and impeded the execution of S&T activities in the laboratories. Most of the participants felt that changes in the Competition in Contracting Act (CICA) usually result in more jobs for Government regulators, with little or no additional protection of the taxpayers' dollars.

5. Finally, the group concluded that if Congress and DOD were unable to implement the previous four recommendations, Congress could establish an independent laboratory commission to develop recommendations for the R&D laboratories. The commission membership should consist of DOD representatives, with the remaining half consisting of civilian representatives with considerable knowledge of the DOD laboratories.

The job of the commission would be to address many of the same issues that were discussed at the workshop. The commission could function in a manner similar to the recent base closure commission. However, the group indicated that its primary purpose would not be to recommend laboratory closures. Nevertheless, they stated the commission could recommend closing some labs if the members thought it was necessary.

The participants asserted that one of the major advantages of this approach is that it would lead to a systematic analysis of DOD's R&D laboratories. Further, they argued that the appointment of a commission would help keep the controversial issue of laboratory consolidation and closure from turning into a political stalemate.

As with group III, the participants were unable to reach complete consensus on this recommendation. Some of the participants were suspicious of how the commission would be formed and whether it would necessarily perform in the best interests of DOD. Nevertheless, the group decided to forward this recommendation because they were skeptical that Congress could address the issue of restructuring the DOD laboratories.

APPENDIX A—WORKSHOP ON CHALLENGES CONFRONTING THE DOD LABORATORIES

ATTENDEES, OCTOBER 18, 1989

WORKSHOP PARTICIPANTS

Dr. Robert Frosch—Moderator, Vice President
General Motors Research Labs
3500 Mound Road
Warren, MI 48090

Dr. John C. Browne, Associate Director, Defense Research
Los Alamos National Laboratory
Mail Stop A110
Los Alamos, NM 87545

Mr. Al Narath, President
Sandia National Laboratory
P.O. Box 5800
Albuquerque, NM 87185

Dr. Herman Postma, Senior Vice President
Martin-Marietta Energy Systems, Inc.
P.O. Box 2009
Oak Ridge, TN 37831-8002

Dr. Alexander Glass, Associate Director
Lawrence Livermore National Laboratory
Livermore, CA 94550

Mr. James Colvard, Associate Director
Applied Physics Laboratory
Applied Physics Road
Laurel, MD 20707

Mr. Donald C. MacLellan, Assistant Director
Lincoln Laboratory
P.O. Box 73
Lexington, MA 02173-0073

Mr. George Uriano
National Institute of Standards and Technology
Advanced Technology Program
Technology Building Room B110
Gaithersburg, MD 20899

Dr. John D. Venables, Corporate Scientist
Martin Marietta Laboratories
1450 South Rolling Road
Baltimore, MD 21227

Mr. Larry Druffel, Director

Software Engineering Institute
Carnegie-Mellon University
Pittsburgh, PA 15213-3890

Dr. Arnold Levine
Office of Technology Assessment
600 Pennsylvania Avenue, S.E.
Washington, DC 20510

Dr. Lawrence Korb, Director of Center for Public Policy Education

Brookings Institute
1775 Massachusetts Avenue
Washington, DC 20036

Dr. Gerry Dinneen, Foreign Secretary
National Academy of Engineering
2101 Constitution Avenue, N.W.
Washington, DC 20418

U.S. ARMY REPRESENTATIVES

Brigadier General (P) Malcolm R. O'Neill, Commander
U.S. Army Laboratory Command
Attn: AMSLC-CG
2800 Powder Mill Road
Adelphi, MD 20783-1145

Dr. Robert Oswall
Headquarters USACE
Directorate of Research and Development
20 Massachusetts Avenue, N.W.
Washington, DC 20314-1000

Mr. Richard Vitali, Director of Corporate Labs
U.S. Army Laboratory Command
Attn: AMSLC-DL
2800 Powder Mill Road
Adelphi, MD 20783-1145

Mr. George Singley, Deputy for Research and Technology
OASA (RDA)
Pentagon
Washington, DC 20310

U.S. NAVY REPRESENTATIVES

Mr. Richard L. Rumpf, Acting Assistant Secretary of the Navy
(Research, Engineering and Systems)
The Pentagon, Room 4E732
Washington, DC 20350

Dr. Fred E. Saalfeld, Director of ONR (Code 10)
800 Quincy Avenue
BCT #1
Arlington, VA 22217-5000

Dr. Timothy Coffey, Director of Research (Code 10012)
Naval Research Laboratory

Washington, DC 20375-5000

Dr. Robert M. Hillyer, Technical Director
NOSC (Code 01)
San Diego, CA 92152-5000

U.S. AIR FORCE REPRESENTATIVES

Brigadier General Steven P. (Pat) Condon
SAF/AQX
The Pentagon
Washington, DC 20330-1000

Dr. Robert Selden, Chief Scientist
HQ USAF/CCN Room 4E320
Pentagon
Washington, DC 20330-5040

Colonel Jim McCormack
Deputy DCS/Technology and Requirements Planning
HDQ/AFSC Andrews Air Force Base
Washington, DC 20334-5000

Dr. Bernard Paiewonsky
Deputy for Technology
SAF-AQH
The Pentagon Room 4D977
Washington, DC 20330-5000

OFFICE SECRETARY OF DEFENSE

Dr. Ted Berlincourt
Director of Research and Laboratory Management
ODD/DR&E
3E114 Pentagon
Washington, DC 20301-3082

Mr. Michael Heeb
ODD/DR&E
3E114 Pentagon
Washington, DC 20301-3082

Ms. Sandra Lefstad
ODD/DR&E
3E114 Pentagon
Washington, D.C. 20301-3082

Colonel Edward Lee
ODD/DR&E
3E114 Pentagon
Washington, DC 20301-3082

WORKSHOP OBSERVERS

Mr. Thomas Reilly, Evaluator
U.S. General Accounting Office
National Security & International Affairs Division
441 G Street, N.W.

Washington, DC 20548
Mr. Thomas Mills
U.S. General Accounting Office
441 G Street, N.W.
Washington, DC 20548

HASC SUBCOMMITTEE R&D

Bill Andahazy

CRS PARTICIPANTS

Mike Davey
Dick Rowberg
Marcia Smith
Bill Boesman
Jack Moteff
Pat Raap

APPENDIX B—WORKSHOP ON CHALLENGES CONFRONTING THE DOD LABORATORIES

WORKSHOP BRIEFING PAPER, OCTOBER 18, 1989

Memorandum: October 9, 1989.

To: DOD Workshop Participants.

From: Michael E. Davey, Analyst in Science and Technology, Science Policy Research Division.

Subject: Workshop Briefing Paper and Workshop Agenda.

Below is the workshop briefing paper that should be read prior to our October 18th workshop. I have also enclosed an agenda for the day, as well as a list of the workshop participants. The agenda includes information on where the workshop will be held and a phone number where you can be reached, while the workshop is in progress. I look forward to seeing all of you on Wednesday.

PURPOSE OF THE BRIEFING PAPER

The primary purpose of this briefing paper is threefold. First, the paper identifies specific laboratory issues that have been plaguing the defense laboratories over the years. Second, the paper outlines three broad alternatives that Congress could consider in order to confront these concerns. And finally, the paper provides a common point of reference on issues confronting the laboratories and options for resolving those issues from which to initiate the workshop discussions. The briefing paper and the workshop itself are not intended to provide an exhaustive analysis of all the complex issues confronting the laboratories; nor is it an attempt to prescribe the answers. Rather, the purpose of the workshop is to assist the House Committee on Armed Services, Subcommittee on Research and Development in gathering information about the laboratories and deciding what further activities the Committee and/or Subcommittee may undertake to address the needs of the defense laboratories.

The Subcommittee recognizes that over the past 40 years the environment in which the laboratories must operate has changed dramatically. Consequently, the laboratories may now be confronted with a series of challenges that existing management and organizational constraints may make difficult to meet. It is in this context that the Subcommittee requested CRS conduct this workshop to explore ways to best utilize the formidable resources of talent and management capabilities comprising the DOD laboratories.

INTRODUCTION

Since the establishment of the Naval Observatory in 1842, laboratories have played a crucial role in fostering innovative discov-

eries in science and technology. Over the past four decades, the Department of Defense (DOD) has invested extensive resources to build and maintain a laboratory system which can support research and development activities essential to national security.

The Pentagon contends that its laboratories play a crucial role in solving science and engineering problems and deficiencies, and in meeting needs that are unique to the military. DOD states that the primary purpose of its laboratories is to develop new technologies to support each of the respective Service missions. According to DOD, the role of the laboratories in the development and improvement of technology and weapon systems is fundamental to the success in improving national security. Further, DOD asserts that the laboratories allow the military a fast reaction capability to solve immediate critical problems that may confront one of the Services.

According to DOD's most recent statistics, in FY 1986, its 72 R&D centers employed approximately 10,000 people and received a little more than \$10 billion from the Federal Government. Of that amount \$3.7 billion was spent in-house; the rest was contracted out.³⁴

It is important to understand that the individual Services rather than DOD really run the laboratories. In fact, the Army, Navy, and Air Force departments own and operate a large number of research, development, and engineering (RD&E) centers. They perform a variety of activities ranging from research (albeit very little compared to the laboratories' overall activities), to full-scale development, to occasional limited-scale manufacturing of military equipment. For practical purposes, the term "DOD laboratories or defense laboratories" refers to these Government-owned and operated RD&E centers.

Further, comparing the defense laboratories among themselves can be deceiving since no two are alike. They differ in the subject areas they focus on, the mix among categories of work (e.g., the proportions of basic, applied, and development activities each performs), and the weighing of their missions among a number of basic tasks. Clearly, the differences among the Services' laboratories make evaluation and comparative analysis difficult to achieve. For example, the DOD laboratories are often criticized for not doing top-flight research, especially when compared to the Department of Energy's (DOE) national laboratories. However, as indicated earlier, performing leading edge scientific research is not the primary mission of these facilities.

Despite these differences there are some common threads interwoven among all the activities the laboratories must perform. They are all expected to be centers of technical expertise that allow the Services to be "smart buyers" of technology and weapon systems. Most do not require the staff to conduct research and contribute to the advancement of science in general, but all benefit from having some staff involved in research and knowledge about research occurring outside of the laboratory. To varying degrees they all develop technology in-house and externally under contract, with the aim

³⁴ There are about an equal number of other centers that do not perform traditional RDT&E activities, but rather are special facilities with a very specific mission, such as flight-testing new or refurbished aircraft.

of transferring it into the procurement system. Finally, the accumulated base of knowledge gained through these activities is used to advise procurement officers on the technical qualities of various proposals to develop and build systems.³⁵

The next section of the briefing paper reviews several issues that have continually resurfaced in numerous reports on the DOD laboratories.³⁶ Again, the primary objective of the workshop is to examine options that Congress could consider to address these issues, and not to debate their severity and impact on the laboratories. Workshop participants could suggest additional issues if they believe their inclusion would greatly assist the discussion regarding potential options.

MAJOR ISSUES CONFRONTING THE DOD LABORATORIES

1. MANY LABORATORIES ARE FUNCTIONING WITHOUT A CLEAR SENSE OF PURPOSE, AND A WELL DEFINED MISSION, AS INDICATED BY THE 1983 PACKARD REPORT

The 1983 Report of the White House Science Council, commonly referred to as the Packard report, observed that some of the laboratories that they reviewed had a fairly well defined mission for some of their work, but that a major part of what the laboratories were doing was "fragmented and unrelated to their mission." The report noted that this often occurs when the national need that justified the creation of the lab no longer exists or is a lower priority.³⁷

Siegfried S. Hecker, Director of Los Alamos National Laboratory, contends that a laboratory's ability to hire and keep top scientific talent is dependent upon the development of a strong primary mission. A strong, well articulated mission can also attract long-term stable support for high-risk activities in science and technology. According to Hecker, laboratories that lack a clear mission find it difficult to "resist the forces that can quickly dilute its efforts and fragment its lines of authority and reporting into numerous, independent efforts."³⁸ Such fragmentation can often cause laboratory managers to lose control of the laboratory's efforts, and can turn them into bookkeepers rather than leaders.

The 1983 Packard report indicated that those laboratories that have a well defined mission tend to be more successful in achieving specific goals. According to the report, those laboratories whose original mission no longer serves high-priority national needs should seek out a new mission, or failing that, should close their doors. The Packard report indicated that the Services' laboratories differ widely in statements of their missions, varying from language with specific guidance to a mission that must be inferred from the RD&E activities that people do at the laboratory. As dis-

³⁵ U. S. Congress. Office of Technology Assessment. Holding the Edge: Maintaining the Defense Technology Base. April 1989 p. 23.

³⁶ A 1987 Defense Science Board study of DOD's technology base programs listed 16 separate studies of the DOD labs, beginning with the 1966 Sheingold report. See Appendix D., p. D-3.

³⁷ Executive Office of the President. Office of Science and Technology Policy. Report of the White House Science Council, Federal Laboratory Review. Washington D.C. May 1983.

³⁸ Testimony before the Senate Armed Services Committee. Subcommittee on Defense Industry and Technology. March 18, 1988. p. 14.

cussed in the Packard report and a DOE report on multipurpose laboratories, the primary mission of many laboratories remains murky even though a clear and consistent sense of its mission is vital to the success of a laboratory.³⁹

2. PERSONNEL AND SALARY CONSTRAINTS INHIBIT THE RECRUITING AND RETENTION OF TOP SCIENTIFIC AND MANAGEMENT TALENT

According to the Office of the Secretary of Defense (OSD) and Service representatives, DOD is often unable to recruit the very best scientific talent available. Further, because of growing salary disparities between the Government and the private sector, OSD is currently experiencing high rates of attrition within its top level S&T managers. In fact, every study of the military laboratories has identified deficiencies in the way they recruit, train, retain, and manage their professional personnel. Both the Packard report and a 1987 Defense Science Board (DSB) report concluded that OSD and the Services face serious disadvantages in hiring and retaining top S&T personnel for three primary reasons: inadequate civil service compensation; "revolving door" restrictions; and a lowering of status associated with Federal employment.⁴⁰

The 1987 DSB report pointed out that private sector starting salaries for newly hired scientists and engineers (S&Es) with bachelor degrees, averaged \$10,000 to \$15,000 higher than comparable Federal employees. The Defense Science Board also indicated that top scientists at the DOE national laboratories are often paid twice as much as their Federal counterparts currently earning between \$50,000 and \$60,000 per year. This is crucial because laboratory directors generally agreed that those S&Es that make-up the top 5% of the laboratory determine the major science and technological thrusts of the laboratory. An internal study conducted at the Naval Research Laboratory (NRL) indicated that between 1985 and 1987, NRL was unable to fill 40 percent of its science and engineering positions due to inadequate compensation.⁴¹

Pre-employment and post-employment personnel restrictions also mitigate against recruiting first-rate political appointees. In the pre-employment arena, political appointees are required to divest themselves of any financial interest that they have in any company conducting business with DOD. Such a requirement often results in serious tax consequences for the political appointee. Furthermore, many potential employees resent the prospect of filing an annual financial disclosure statement.

According to OSD and Service representatives, conflicts-of-interest legislation has significantly limited DOD's ability to hire top-level S&T managers from the private sector who have had experience working in the defense arena. Compared with their predeces-

³⁹ "Domestic Models for National Laboratory Utilization." T.J. Wilbanks in the U.S. Department of Energy, Office of the Secretary, The Department of Energy's Multiprogram Laboratories, Vol. II, September 1982, p. 68.

⁴⁰ Executive Office of the President, Office of Science and Technology Policy, Report of the White House Science Council, Federal Laboratory Review, Washington D.C. May 1983, p. 6. Office of the Under Secretary of Defense for Acquisition, Report of the Defense Science Board 1987 Summer Study on Technology Base Management, December 1987, p. 16.

⁴¹ Internal Naval Research Laboratory study on Future Operating Options for the Navy Laboratories, September 1988, p. 35.

sors, many top level S&T managers now come to DOD with little or no defense experience.

3. LONG DELAYS OCCUR IN UPDATING BUILDINGS AND PURCHASING MAJOR PIECES OF RESEARCH EQUIPMENT

The ability to conduct leading edge research also depends on laboratories being able to purchase state-of-the-art research equipment and facilities. Further, it is widely recognized in academia, Government and industry that modern research facilities serve as a strong attraction when recruiting scientists. In turn, an excellent research staff, to a degree, will help generate good facilities.

DOD laboratories face facilities modernization problems for several reasons. First, as the 1987 DSB report noted, DOD laboratory directors do not have control over many crucial laboratory support elements, including facilities. Those individuals in the laboratories responsible for facilities activities either report to the Services' "buying commands" or headquarters. Secondly, requirements for new R&D facilities are combined in with the overall military construction (MILCON) budget. This means that laboratory facilities must compete with higher priority items such as military housing.

According to the DSB, this has led to a decline in the physical facilities supporting the DOD's R&D laboratories. NRL recently estimated that at the current rate of existing facilities replacement and renewal, it will take almost 80 years to renovate the laboratories' outdated facilities. Obviously, at this rate NRL and the DOD laboratories in general will not be able to keep pace with the equipment they will need or the missions they are designed to support.

However, it should be pointed out that there are those who believe that this problem may not be the result of DOD laboratories being Government-owned and-operated facilities. For example, both NASA centers and the National Institute for Standards and Technology (NIST) have demonstrated greater success in this area. NIST appears to do better because of the lead role it plays in measurement science, and because it has strong ties to industry. At NASA, the centers have a stronger voice in defining their programs and enjoy stronger ties between the centers and their principal buyers than the DOD laboratories.

4. FUNDING IS OFTEN UNPREDICTABLE, FLUCTUATES FROM YEAR TO YEAR, AND CAN STIFLE LONG RANGE PLANNING ACTIVITIES

According to Robert J. Art, effective budgeting procedures help top-level decision makers do three things. The first is to develop medium to long-term planning frame work to guide their decisions. The second is to make strategic trade-offs in how resources are allocated throughout the organization. And the third is to evaluate the results of their decisions so they can be included in the next round of planning.⁴²

The 1983 Packard report concluded that the process by which laboratories are funded essentially prohibits rational planning and effective conduct of R&D. The annual budgeting process consumes

⁴² Art, Robert J. The Pentagon: The Case for Biennial Budgeting. Political Science Quarterly. Summer 1989. p. 195.

too much time at too many layers both within DOD and the Services. The Packard report pointed out that delayed congressional appropriations contribute to indecision, often well into the next fiscal year when all funds must be obligated.

The cost of annual budgeting has been to devalue the planning and evaluation phases of the resource allocation process. Annual budgeting cycles have greatly contributed to a short-term planning focus among the DOD laboratories. Several laboratory studies have indicated that instead of laboratory directors focusing their energies on systematic evaluation of R&D activities, they are usually pre-occupied with the annual "battle of the budget."

Starting in FY 1988, DOD submitted to Congress two-year RDT&E budgets for FY1988 and FY 1989. However, the two-year budget applied to authorizations, not to appropriations. Further, when funds finally reach the laboratory, it is usually very difficult to transfer them to other accounts where they might be needed more. The funds also must be obligated in the fiscal year for which they were appropriated, preventing the development of a contingency fund. Such a requirement makes it very difficult for DOD to sustain long-term work.

5. BURDENOME PROCUREMENT REGULATIONS OFTEN IMPEDE RESEARCH AND DEVELOPMENT ACTIVITIES WITHIN THE LABORATORIES

Study after study of the defense procurement system has noted the frustration with the growing length of the procurement process. Delays in weapons acquisition lead to lost time in fielding new weapon systems which could threaten the U.S. technological lead. The introduction to a review of six major studies of defense procurement states that "the bulk of the cures proposed as far back as 1948 were still being proposed in 1983 because they had never been implemented."⁴³

Laboratory directors have little control over the procurement office in their laboratories. In an on-going study of the U.S. laboratory system, Michael Crow and Barry Bozeman compared the amount of time it took laboratory personnel to complete typical procurement actions among industry, university and Government R&D laboratories. The authors asked representatives from these laboratories to indicate the length of time it took to: buy low-cost (less than \$1,000) and high cost equipment (more than \$1,000); acquire internal funding for individual investigator research; and get approval for intermediate to large-scale team research.⁴⁴

For low and high cost research equipment, Federal laboratories, on average, took about two weeks longer to purchase equipment than did industry and university laboratories. To acquire approval for individual investigator research and internal large scale research Federal laboratories took twice as much time, (7.4 weeks versus 15.5 weeks) as did the other laboratories. The average time

⁴³ David Lockwood, Andrew Mayer, and Cheryl Crow, U. S. Library of Congress, Congressional Research Service. Defense Acquisition: Major U.S. Commission Reports (1949-1988) Vol. I. Prepared for the Defense Policy Panel and Acquisition Policy Panel of the Committee on Armed Services, House of Representatives, Committee Print No. 26, Nov. 1, 1988. p. v.

⁴⁴ Michael M. Crow and Barry L. Bozeman. Bureaucratization In the Laboratory. Research and Technology Management. September-October 1989, p. 30.

for Federal laboratories to approve large scale team research was 26 weeks, while all the other laboratories required half that time.⁴⁵

6. AN OVERALL MANAGEMENT SYSTEM WHICH CAN BURDEN LABORATORY DIRECTORS AND TOP MANAGERS WITH A MORASS OF RULES AND REGULATIONS

The 1983 Packard report on the Federal laboratories indicated that excessively detailed instruction for R&D programs, both from Congress and DOD itself, commonly referred to as micromanagement, "has seriously impaired R&D performance in some laboratories." The growth of the internal DOD budget review process, along with increased congressional budgetary oversight has created extensive management layers within DOD and tied the hands of many top level laboratory managers.

According to a recent article, in 1970, Congress requested 31 reports or studies from DOD. By 1985, that number had climbed to 458. Concomitantly, legal provisions detailing how DOD is to carry out certain aspects of its responsibilities increased from 64 to 213, while annual congressionally mandated actions requiring specific DOD compliance increased from 18 to 202.⁴⁶ As a result, in many laboratories, the role of the research managers and branch chiefs has changed dramatically. Rather than overseeing and evaluating the quality and relevance of R&D activities in the laboratories, they spend most of their time shielding bench scientists from various reporting tasks generated by DOD and Congress.

Finally, as indicated earlier, laboratory directors are often held accountable for important activities for which they have no authority. For example, at most DOD laboratories individuals charged with crucial support activities (e.g., facilities, personnel, procurement, financial management, legal counsel, etc.) often report to other organizations that do not have responsibility for facilitating the laboratory's mission. The 1983 Packard report suggested that laboratory directors be given authority for all activities necessary for the laboratory to achieve its mission.

OPTIONS FOR CONGRESSIONAL CONSIDERATION

The remaining portion of the briefing paper reviews three broad options that Congress might consider in order to successfully confront these challenges facing the DOD laboratories. As indicated in the enclosed agenda, the workshop participants will break into three groups to discuss the advantages and disadvantages of their respective option. Further, the participants will discuss the extent to which each alternative can resolve the major laboratory concerns without compromising the overall mission of the DOD laboratories.

One of the option that could have been discussed is to do nothing and allow the laboratories to operate as they have in the past. Nevertheless, given the stated purpose of the workshop, the likely con-

⁴⁵ Ibid., p. 31.

⁴⁶ Daniel J. Kaufman, National Security: Organizing the Armed Forces. Armed Forces & Society. March 16, 1988. p. 5.

tinuation of budgetary constraints, and the rapidly changing international environment, such an option does not appear to be practical.

1. INSTITUTE INCREMENTAL IMPROVEMENTS FOR THE DOD LABORATORY SYSTEM WITHIN THE CONSTRAINTS OF THE CURRENT CIVIL SERVICE GUIDELINES

The DOD laboratories are Government-owned and Government-operated facilities (GOGOs), staffed primarily by Federal employees (70% civilian and 30% military) who are subject to the rules and regulations of the Federal Office of Personnel Management (OPM). Many of the laboratories are small, with well defined missions such as the Army's Cold Regions Research and Engineering Laboratory; several of the laboratories are relatively large and diverse such as the Naval Research Laboratory or the Air Force's Rome Air Development Center.⁴⁷

In order to address some of the personnel issues facing the laboratories, Congress has allowed OPM to initiate a number of experimental personnel projects to demonstrate improved personnel management in the Government. The Civil Service Reform Act of 1978 authorized the use of experimental personnel projects in the Federal Government. Over the last decade, one of the most highly publicized personnel experiments has been carried out in two Navy laboratories, the Naval Ocean Systems Center and the China Lake Naval Weapons Center (NWC), with two other Navy laboratories acting as controls.

The China Lake experiment, as it is usually referred to, breaks with the standard Federal Personnel system in four ways:

- (1) it separates career paths, with distinct paths for scientists and engineers, on the one hand and technical or administrative specialists, on the other;
- (2) it consolidates 15 General Schedule (GS) grade classifications into no more than 5 broad "pay bands" corresponding to career paths;
- (3) it establishes abbreviated position descriptions and standards; and
- (4) it provides a much closer link between pay and performance.

Although OPM had originally set up the experiment to run 5 years, Congress has extended it until 1990.

In general, both OPM and a General Accounting Office (GAO) study found that the project had essentially succeeded in doing what it was intended to do. Compared to the two control sites, personnel at the demonstration sites found the system to be more flexible than the Navy's conventional performance appraisal system. That is, due to the broader pay bands, managers could offer new employees higher starting salaries and distribute pay increases based on performance. However, even though China Lake has been deemed a success, Congress has not allowed it (primarily for cost reasons) to be adopted by other DOD laboratories.

⁴⁷ Portions of this section are taken from U.S. Congress. Office of Technology Assessment. Holding the Edge: Maintaining the Defense Technology Base. April 1989.

Further, one can conceive of small-scale improvements to the current system even without instituting performance-based pay. Since the establishment of the China Lake experiment, OPM has authorized mechanisms that make it easier for agencies to hire qualified professional staff. For example, laboratories can now apply to OPM for authority to hire engineers directly, without screening by OPM. Also, OPM allows the laboratories to negotiate starting salaries with highly qualified candidates at GS-11 and higher.

Nevertheless, the China Lake experiment and recent OPM flexible personnel policies do not address the problem of providing outstanding scientists and DOD laboratory directors and managers with salaries that are competitive with universities and the private sector. Perhaps the National Institute of Standards and Technology (NIST) personnel demonstration project, which is similar to China Lake, might better address this concern. Directors of the NIST project have been given the authority to adjust the salaries that they pay their scientists and engineers to match those paid by the private sector for comparable work. Consequently, NIST salaries are already among the highest at Federal laboratories.

Members of Congress have introduced bills aimed at raising the compensation of top scientists in the Federal Government. Senator Bingaman attached the Compensation for Critical Employees amendment to the FY 1990 Defense Authorization bill. The amendment would allow the Secretary of Defense to designate 500 science and engineering positions as critical and to provide compensation of up to \$135,000 for those positions. In the past, Senator Bingaman has been unsuccessful in getting Congress to expand the China Lake experiment, as well as to provide higher pay for critical science and engineering positions. It is unlikely that the full Congress will approve this amendment as well, primarily because Congress, and to some extent OPM, is reluctant to establish yet another separate pay schedule for a select group of individuals within the Federal Government.

Finally, it is important to keep in mind that all personnel experiments are supposed to be "revenue neutral." This means that the agency cannot request any additional funds to implement the experiment. If Congress continues to insist on this prerequisite, it appears that Government-wide pay adjustments will not be likely.

In the area of management and procurement, the 1983 Packard report recommended amending existing laboratory regulations and DOD directives which would provide laboratory directors with greater accountability for their laboratories. This would include appointing the director for a specific length of time, with the option of extending or prematurely terminating the appointment based on the performance of the director. However, if this were adopted, lab directors would have to be given direct authority for all laboratory activities, including support services. This could include such changes as raising the \$200,000 limit on local approval for new facilities.

Another incremental modification could involve Congress in adopting biennial appropriations for DOD's R&D programs. Biennial appropriations might decrease the considerable amount of time DOD personnel have to spend preparing, reviewing, and defending

annual budgets. It would also add stability and efficiency to laboratory activities by providing known-funding levels for future laboratory programs.

Multiyear budgeting could allow DOD and Congress additional time to consider laboratory activities in terms of strategic options. Furthermore, rather than making funding decisions based on isolated program elements, an overall strategic budgeting approach might help Congress understand the trade-off implications of different laboratory programs.

Certainly there are some disadvantages to multiyear funding. Congress would be giving up some of its annual oversight powers, primarily in the area of budgetary actions. Further, if budget projections proved to be inaccurate, it could be difficult to make mid-cycle revisions, or to accommodate changes in budget priorities.

A final consideration under this option would be to give laboratory directors greater flexibility to distribute funds once they are available. One approach that could be considered is to have the Services adopt the Navy's Naval Industrial Funding (NIF) approach. NIFs are designed for activities that provide services and/or products that can be charged to customers in a fashion similar to private industry. This approach allows laboratory management more authority and information to make management decisions. NIF also includes an Asset Capitalization Program approved by Congress in 1983, which provides for obtaining equipment by an overhead charge to customers.

2. TREAT DOD'S R&D ACTIVITIES DIFFERENTLY BY ALLOWING SOME OF THE LABORATORIES TO CONVERT TO GOVERNMENT-OWNED, CONTRACTOR-OPERATED FACILITY

In its 1987 report, the Defense Science Board suggested that "where existing Government laboratories [DOD laboratories] are not performing well, conversion to a Government-owned and contractor-operated laboratory has some attractive properties."⁴⁸ The report did recognize that such a conversion could cause significant disruption as well as political opposition. Nevertheless, the DSB indicated that in some circumstances, such a conversion may be in the best interest of the laboratory.

Government-owned, contractor-operated (GOCO) laboratories were established during and following World War II as a way to bring top scientific talent to bear on crucial national security problems. The contractor-operated approach was chosen to avoid the cumbersome civil service bureaucracy and to expedite solving important science and technology problems. The Atomic Energy Act of 1946 and 1954 expressly authorized laboratory management contracts with industrial and academic organizations.

One important question to examine is the extent to which GOCO laboratories become more like Government laboratories, since they must account for public funds. The evidence suggest that there is no simple answer. Over the past few years, there appears to have been a gradual shift toward DOE attempting to get the laboratories to conform more closely to legislation and regulation.

⁴⁸ Ibid., Defense Science Board 1987 Study on Technology Base Management. p. 15.

The view from DOE headquarters and language in DOE funding bills indicates that the laboratories' GOCO status does not exempt them from complying with the spirit of Federal policy. The GAO's Deputy Comptroller General indicated that the DOE laboratories must comply with "the Federal norm."⁴⁹

Clearly, one area where the laboratories set their own policy is in personnel management. The personnel system at each DOE laboratory reflects that of the prime contractor. There are no assigned slots in the laboratories and top technical people can earn \$95,000, although most make less. Senior executives earn between \$100,000 and \$150,000, approximately twice what their counterparts at the military laboratories earn.

In the area of procurement, the evidence is not so clear. While laboratories like Sandia follows AT&T procurement and personnel management policies, Sandia is also bound by a number of Federal regulatory constraints. These include adhering to DOE acquisition regulations and directives of the Federal Acquisition Regulation, the Buy American Act, and prevailing-wage legislation on federally subsidized construction contracts. The laboratories also fall under the Federal Contract Compliance Programs.

On the other hand, the laboratories are exempt from a number of requirements that bind Federal agencies. These include formal advertising, set-aside programs, and the Competition and Contracting Act, about which the DOD laboratories have bitterly complained. The laboratories also are exempt from the Brooks Act, which governs the procurement of computers and telecommunications equipment. An internal NRL study indicated that for some DOE facilities, the time it took to procure a \$100,000 piece of equipment was about equal with Federal laboratories. The NRL study also indicated that DOE and DOD laboratories required almost the same amount of time to respond to multimillion dollar contracts.

In some respects, the GOCO funding mechanisms appear to be more flexible than DOD's GOGO laboratories. DOE allocates funds to each institution annually, based on its mission and the size of the staff. But unlike the DOD laboratories, DOE laboratories do not receive their funds in one lump-sum. Instead, they receive money from hundreds of separate sources including other DOE components or headquarters program offices, with specified agreements for each task. In some ways, this resembles NIF funding described earlier. DOE-sponsored work is funded by "no-year" money, which is available until spent. DOD laboratories must obligate all their funding within the fiscal year that it is appropriated.

At the present time, it is not apparent that GOCOs have a distinct advantage over DOD's GOGO's in improving their facilities. Approval for capital improvements are made outside of the laboratory, usually by Congress. It is certainly not apparent that defense-related GOCOs would do any better under such an arrangement. One approach might be to operate under a Unified Budget Concept. The contractor then could shift money among personnel, facilities, etc., as deemed necessary.

⁴⁹ Decision of the Deputy Comptroller General in protest of Piasecki Aircraft Corp. (B-190178, July 6, 1978), p. 10.

Another important consideration is to what extent GOCOs eventually become more like Government laboratories since they must account for public funds. Growing evidence suggests that with time, Government-owned, contractor-operated laboratories tend to become more like Federal laboratories because they have to account for Government funds. For obvious reasons, no Federal agency can give its contractor-operated facilities complete freedom to set policy within the framework of the laboratories' mission. Further, DOE delegation of "inherently government functions" to its national laboratories does not violate this premise, primarily because an agency can delegate those functions, while holding its contractors to strict accountability.

This does raise the issue of how successful DOE has been in overseeing the operations of its contractor-operated laboratories. Although the DOE operations offices are supposed to oversee the laboratories and weapons production facilities, evidence suggests that the oversight may have not been stringent enough. Perhaps the problems are centered at the production facilities and not the national laboratories. Nevertheless, if the production facilities concerns prove to be accurate, Congress may decide to tighten its oversight of DOE's laboratories.⁵⁰

Clearly there are some advantages and disadvantages for converting to a GOCO arrangement, although both are shrouded in uncertainty. One question to be addressed is to what extent sufficient improvements would be gained in non-personnel areas under a GOCO arrangement to justify such a change. A qualitative uncertainty is how well a GOCO would work in the DOD environment. Finally, this discussion continues to beg the question as to whether DOD could afford to convert all of its laboratories to GOCOs. If not, which laboratories would be converted and why? These questions lead directly to the third and final option.

3. CLOSE SOME LABORATORIES, AND CONSOLIDATE OTHERS, WHILE MODIFYING MANAGEMENT ARRANGEMENTS FOR THE REMAINDER

One could make the argument that with the growth in private sector R&D capabilities, DOD no longer needs 72 R&D laboratories.⁵¹ Given the likelihood of shrinking defense budgets, closure and consolidation may be more palatable now than anytime since the early 1970s. Such activities have occurred in the past. For example, in the early 1970s the Air Force initiated a major reorganization of its laboratories, converting its Cambridge Research Laboratory from basic research to an "exploratory development" institution, closing the Aerospace Research Laboratory at Wright-Patterson AFB, and delisting one of its contract research centers. NASA closed its Electronics Research Center and transferred the facility to the Department of Transportation, and the Army's Fort Detrick became a contractor-operated facility working for the National Institutes of Health.

⁵⁰ There has been limited congressional oversight of the DOE laboratories since the abolishment of the Joint Committee on Atomic Energy in the mid-1970s.

⁵¹ The Office of Management and Budget has issued circulares barring agencies from performing activities that could be done in the private sector.

Short of actually closing laboratories, the Services could keep them open, but encourage the laboratories to seek other sponsors as budgets tighten. However, if some of the laboratories were unsuccessful in finding sponsors, the Services would have to decide whether they would be better off cutting all laboratory budgets 20 percent or closing 20 percent of the laboratories, for example.

If the Services chose the latter, one option they could consider is to establish one corporate laboratory while restructuring their full spectrum weapons development centers. Corporate laboratories could perform the majority of the technology base work for the Services, generate research concepts, and nurture them to the demonstration phase. Meanwhile the remaining engineering and development centers would have to continue to establish priorities in their development programs, maintain close contact with the corporate lab, and continue to transition technology into new systems.

While restructuring the laboratory system, the Services could implement a GOGO-GOCO management hybrid scheme. Under this arrangement, the laboratories would remain federally operated, but with centralized management that could contract out support services. Contracting out would allow the laboratories to pay market rates for support services; give the laboratory directors greater flexibility in hiring workers and dismissing them when they were no longer needed; and bring in professionals who would not otherwise work for the Government. For example, laboratories could contract out facilities management, supply operations, and financial and administrative processing. Scientists and engineers would remain Federal employees. To improve the salary situation, the laboratories could adopt the China Lake model and/or seek special exceptions, similar to those granted medical doctors at NIH and the Uniformed Services University of the Health Sciences (USUHS).⁵²

Finally, any discussion involving the closure or reorganization of the laboratories has to address political realities of closing any military facility. Many people have commented that while it may be difficult to open a laboratory, it is almost impossible to close one. A recent model that might be employed to decide which laboratories should be consolidated or closed, while helping to avoid political pitfalls, might be the military base closure procedure passed by Congress (P.L. 100-526).

⁵² Existing law (Code 10, Section 2113, para. f.) allows doctors who are civil servants, working for the USUHS, to be paid in excess of \$100,000 per year to reflect medical salaries at fully accredited universities.

